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Viele, Blackwell & Buck

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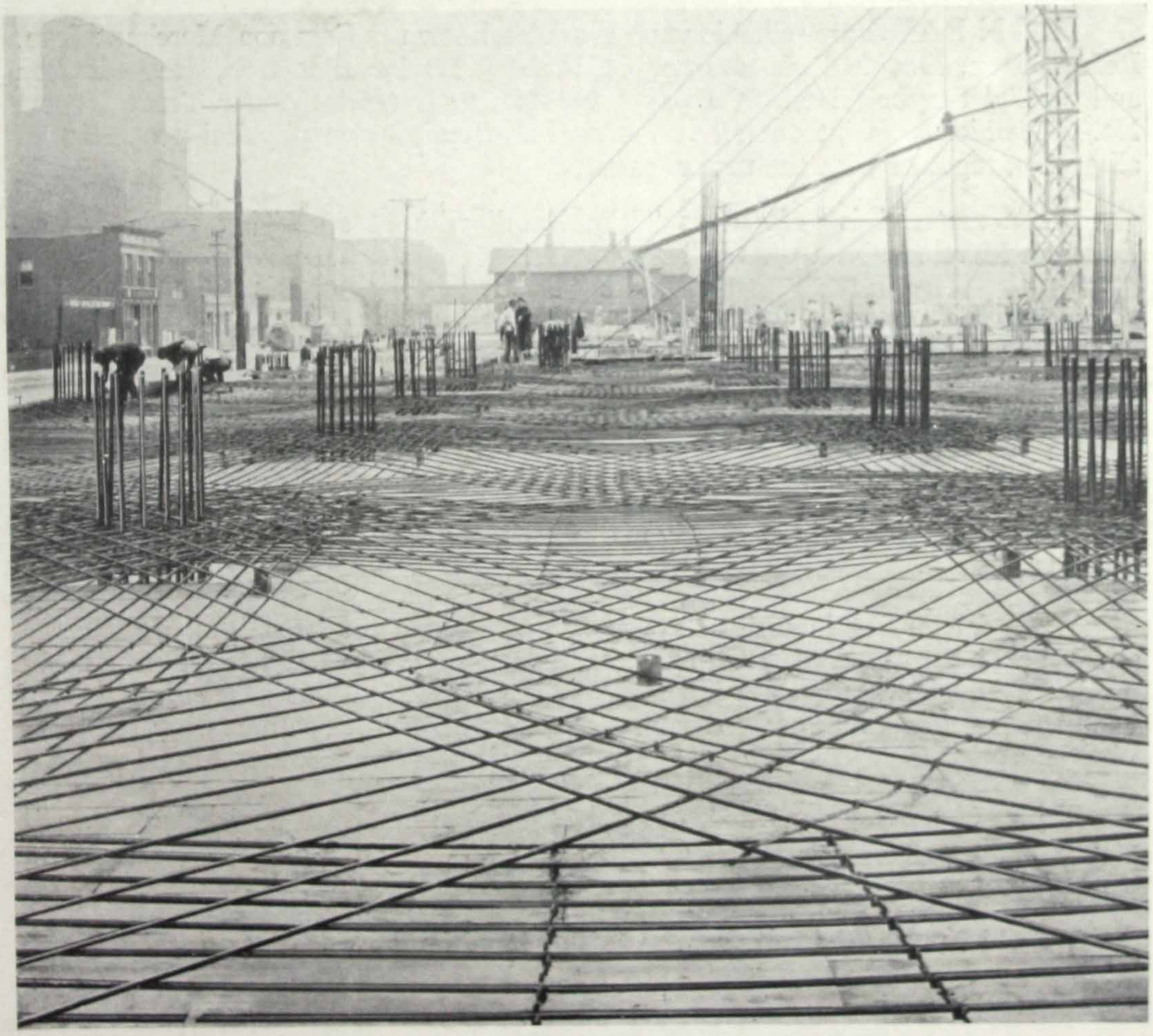
Bulletin No. 3-A

IRON AND STEEL BARS



IN submitting this bulletin we are not attempting to illustrate every type, weight or size of bar. Our aim is to present a representative study sufficient for a comprehensive knowledge of the steel and iron bars most popular in the markets of the world. We have confined ourselves to the product as standardized by American mills, and with the exception of deformed bars, have avoided all shapes and grades of a special nature. We are prepared, however, to supply all manner of steel and iron bars whether standard or special and whether or not shown in the following pages. On receipt of specifications we will gladly quote on bars of every description, such as Rivet Bars, Horse Shoe Bars, Beaded Bars, Grooved Bars, Irregular Bars, J-Bars, U-Bars, V-Bars, etc.

STEEL BARS are furnished in either a mild (soft) or hard steel, **and when ordering it should always be specified whether mild or hard steel bars are required.**

When neither iron nor steel bars are specified, steel is understood.

IRON BARS are rolled in various grades, known as Common Merchant Iron, Refined Iron, Double Refined Iron, Chain Iron, Engine Bolt Iron, Staybolt Iron and Special Staybolt Iron. On pages 316 to 319 is reprinted our Trade Report No. 203, which goes into detail regarding the chemical and physical properties of all grades, together with the uses of each.

When material is ordered as "Iron Bars" without specifying grade or use, Common Merchant Iron Bars will be supplied.

Lengths. Unless otherwise mentioned, steel and iron bars will be supplied in random mill lengths of from 16 to 20 feet.

Packing. Unless otherwise agreed upon, bars will be packed in bundles to suit mill's convenience, the weights of bundles averaging from 150 to 250 pounds each. The wrapping will consist only of tying the bundles securely with wire.

Marking. Bars will be clearly marked with suitable paint or securely attached metal tags.

When forwarding inquiries state wherever possible the quantities of each size and type of bar required. With detailed specifications in hand lower prices and quicker shipments are usually possible. Without specifications base prices will be quoted and orders will be entered subject to approval of specifications when received. Lists indicating the extras to be added to base prices will be forwarded upon request.

Tables of weights are listed, the weights of iron and steel bars being approximately the same. These tables do not necessarily indicate the limits of sizes in which bars can be rolled.

We will be pleased at all times to receive inquiries, specifications or requests for information relative to steel and iron bars.

STUTTGART PLANT
ANALYSIS

SQUARE BARS

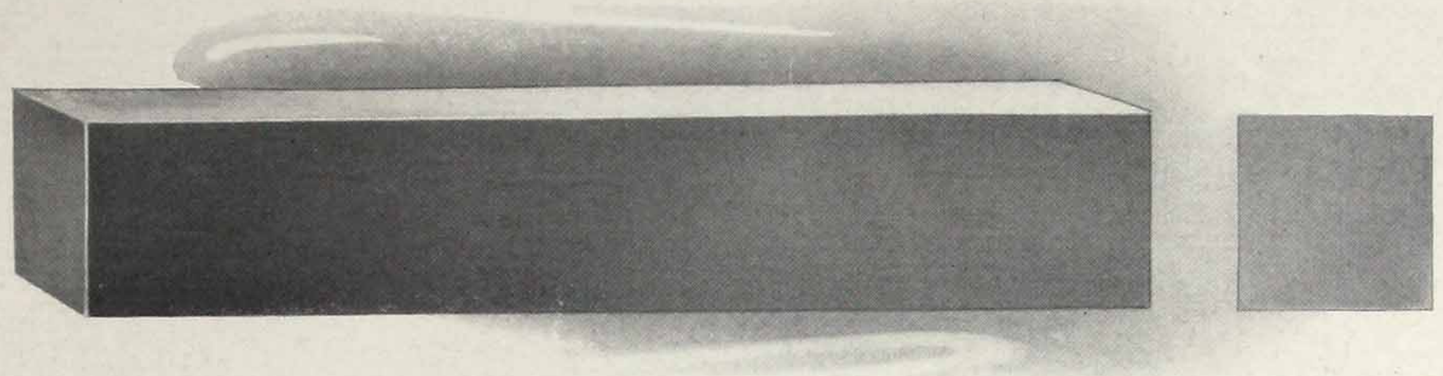


FIG. No. 1

SIZES AND WEIGHTS OF SQUARE BARS

Size, Inches	Pounds, per Foot	Kilos, per Meter	Size, Inches	Pounds, per Foot	Kilos, per Meter	Size, Inches	Pounds, per Foot	Kilos, per Meter	Size, Inches	Pounds, per Foot	Kilos, per Meter	Size, Inches	Pounds, per Foot	Kilos, per Meter	Size, Inches	Pounds, per Foot	Kilos, per Meter
3/16	.120	.178	23/32	1.756	2.614	1 1/2	7.650	11.385	2 9/16	22.326	33.225	3 3/4	47.813	71.153	5 7/8	117.4	174.691
13/64	.140	.209	47/64	1.834	2.729	1 17/32	7.972	11.864	2 19/32	22.874	34.041	3 13/16	49.420	73.545	5 15/16	119.9	178.411
7/32	.163	.242	3/4	1.913	2.846	1 9/16	8.301	12.352	2 5/8	23.428	34.866	3 7/8	51.053	75.976	6	122.4	182.131
15/64	.187	.278	49/64	1.993	2.966	1 19/32	8.636	12.852	2 21/32	23.989	35.701	3 15/16	52.713	78.446	6 1/16	125.0	186.000
1/4	.213	.316	25/32	2.075	3.088	1 5/8	8.978	13.361	2 11/16	24.557	36.546	4	54.400	80.956	6 1/8	127.6	189.868
17/64	.240	.357	51/64	2.159	3.213	1 21/32	9.327	13.880	2 23/32	25.131	37.400	4 1/16	56.113	83.506	6 3/16	130.2	193.737
9/32	.269	.400	13/16	2.245	3.340	1 11/16	9.682	14.409	2 3/4	25.713	38.265	4 1/8	57.853	86.096	6 1/4	132.8	197.606
19/64	.300	.446	53/64	2.332	3.470	1 23/32	10.044	14.947	2 25/32	26.300	39.139	4 3/16	59.620	88.726	6 5/16	135.5	201.624
5/16	.332	.494	27/32	2.421	3.602	1 3/4	10.413	15.497	2 13/16	26.895	40.024	4 1/4	61.413	91.394	6 3/8	138.2	205.641
21/64	.366	.545	55/64	2.511	3.737	1 25/32	10.788	16.055	2 27/32	27.496	40.918	4 5/16	63.232	94.101	6 7/16	140.9	209.659
11/32	.402	.598	7/8	2.603	3.874	1 13/16	11.170	16.623	2 7/8	28.103	41.822	4 3/8	65.078	96.848	6 1/2	143.7	213.825
23/64	.439	.653	57/64	2.697	4.013	1 27/32	11.558	17.200	2 29/32	28.717	42.736	4 7/16	66.951	99.635	6 9/16	146.5	217.992
3/8	.478	.711	29/32	2.792	4.156	1 7/8	11.953	17.788	2 15/16	29.338	43.661	4 1/2	68.850	102.461	6 5/8	149.2	222.009
25/64	.519	.772	59/64	2.890	4.300	1 29/32	12.355	18.386	2 31/32	29.966	44.595	4 9/16	70.776	105.327	6 11/16	152.1	226.324
13/32	.561	.835	15/16	2.988	4.447	1 15/16	12.763	18.993	3	30.600	45.538	4 5/8	72.728	108.231	6 3/4	154.9	230.491
27/64	.605	.900	61/64	3.089	4.597	1 31/32	13.178	19.612	3 1/32	31.241	46.492	4 11/16	74.707	111.177	6 13/16	157.8	234.806
7/16	.651	.969	31/32	3.191	4.748	2	13.600	20.239	3 1/16	31.888	47.455	4 3/4	76.713	114.162	6 7/8	160.7	239.121
29/64	.698	1.039	63/64	3.295	4.903	2 1/32	14.028	20.877	3 3/32	32.542	48.428	4 13/16	78.745	117.186	6 15/16	163.6	243.436
15/32	.747	1.112	1	3.400	5.060	2 1/16	14.463	21.524	3 1/8	33.203	49.412	4 7/8	80.803	120.249	7	166.6	247.900
31/64	.798	1.187	1 1/32	3.616	5.381	2 3/32	14.905	22.181	3 5/32	33.871	50.406	4 15/16	82.888	123.351	7 1/16	169.6	252.364
1/2	.850	1.265	1 1/16	3.838	5.712	2 1/8	15.353	22.848	3 3/16	34.545	51.409	5	85.000	126.494	7 1/8	172.6	256.828
33/64	.904	1.345	1 3/32	4.067	6.052	2 5/32	15.808	23.525	3 7/32	35.225	52.421	5 1/16	87.138	129.676	7 3/16	175.6	261.292
17/32	.960	1.428	1 1/8	4.303	6.404	2 3/16	16.270	24.212	3 1/4	35.913	53.444	5 1/8	89.303	132.899	7 1/4	178.7	265.905
35/64	1.017	1.513	1 5/32	4.546	6.765	2 7/32	16.738	24.909	3 9/32	36.606	54.476	5 3/16	91.495	136.161	7 5/16	181.8	270.518
9/16	1.076	1.601	1 3/16	4.795	7.136	2 1/4	17.213	25.616	3 5/16	37.307	55.519	5 1/4	93.713	139.462	7 3/8	184.9	275.131
37/64	1.136	1.691	1 7/32	5.050	7.515	2 9/32	17.694	26.332	3 11/32	38.014	56.571	5 5/16	95.957	142.801	7 7/16	188.1	279.892
19/32	1.199	1.784	1 1/4	5.313	7.907	2 5/16	18.182	27.058	3 3/8	38.728	57.633	5 3/8	98.228	146.180	7 1/2	191.3	284.654
39/64	1.263	1.879	1 9/32	5.581	8.306	2 11/32	18.677	27.795	3 13/32	39.449	58.706	5 7/16	100.526	149.600	7 9/16	194.5	289.416
5/8	1.328	1.977	1 5/16	5.857	8.716	2 3/8	19.178	28.541	3 7/16	40.176	59.789	5 1/2	102.850	153.059	7 5/8	197.7	294.177
41/64	1.395	2.077	1 11/32	6.139	9.136	2 13/32	19.686	29.297	3 15/32	40.910	60.881	5 9/16	105.2	156.537	7 11/16	200.9	298.939
21/32	1.464	2.179	1 3/8	6.428	9.566	2 7/16	20.201	30.063	3 1/2	41.650	61.982	5 5/8	107.6	160.108	7 3/4	204.2	303.849
43/64	1.535	2.284	1 13/32	6.724	10.007	2 15/32	20.722	30.838	3 9/16	43.151	64.216	5 11/16	110.0	163.68	7 13/16	207.5	308.76
11/16	1.607	2.392	1 7/16	7.026	10.456	2 1/2	21.250	31.624	3 5/8	44.678	66.489	5 3/4	112.4	167.251	7 7/8	210.9	313.819
45/64	1.681	2.501	1 15/32	7.335	10.916	2 17/32	21.785	32.420	3 11/16	46.232	68.801	5 13/16	114.9	170.971	7 15/16	214.2	318.729
															8	217.6	323.788

Bars over 8 inches square can also be furnished. To determine approximate weight per foot of any size bar, multiply the sectional area in square inches by 3.4 for pounds per foot, or 5.06 for kilos per meter.

ROUND CORNERED SQUARE BARS

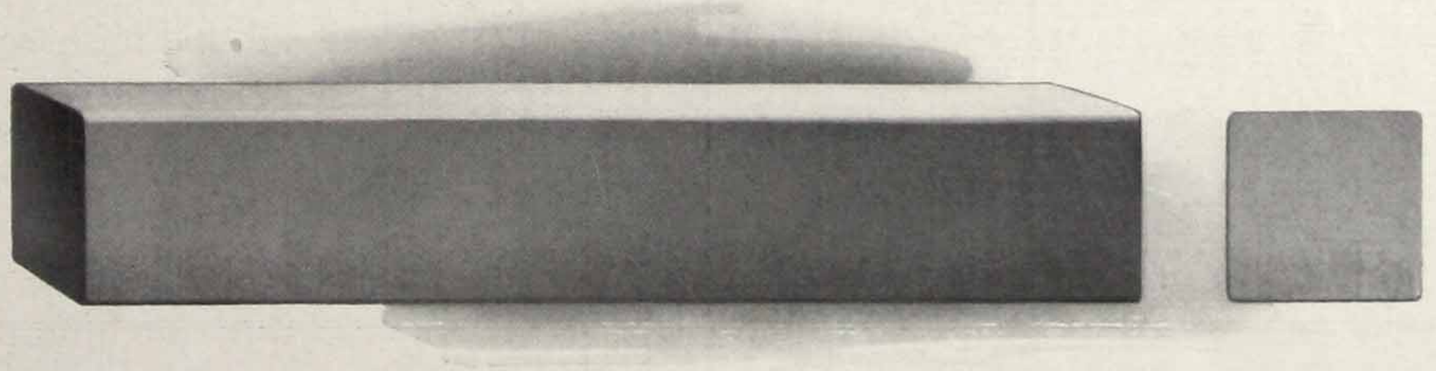


FIG. No. 2

Weights of Round Cornered Square Bars are approximately the same as those given for Square Bars.

ROUND BARS

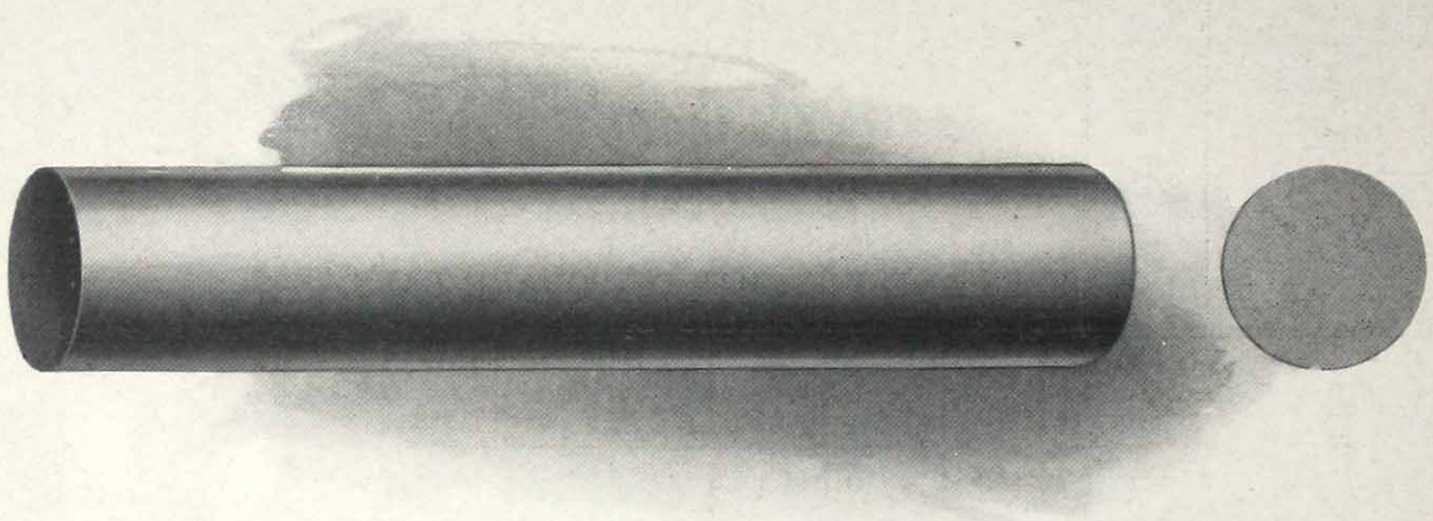


FIG. No. 3

SIZES AND WEIGHTS OF ROUND BARS

Size, Inches	Pounds, Per Foot	Kilos, Per Meter	Size, Inches	Pounds, Per Foot	Kilos, Per Meter	Size, Inches	Pounds, Per Foot	Kilos, Per Meter	Size, Inches	Pounds, Per Foot	Kilos, Per Meter	Size, Inches	Pounds, Per Foot	Kilos, Per Meter	Size, Inches	Pounds, Per Foot	Kilos, Per Meter
7/32	.1278	.190	3/4	1.5021	2.235	1 9/16	6.5194	9.702	2 5/8	18.4004	27.383	3 7/8	40.097	59.671	6	96.13	143.058
15/64	.1467	.218	49/64	1.5653	2.329	1 19/64	6.7828	10.094	2 21/32	18.8412	28.039	3 15/16	41.401	61.612	6 1/16	98.15	146.064
1/4	.1669	.248	25/32	1.6299	2.426	1 5/8	7.0514	10.494	2 11/16	19.2871	28.703	4	42.726	63.583	6 1/8	100.18	149.088
17/64	.1884	.280	51/64	1.6957	2.524	1 21/32	7.3252	10.901	2 23/32	19.7382	29.375	4 1/16	44.071	65.586	6 3/16	102.24	152.151
9/32	.2112	.314	13/16	1.7629	2.624	1 11/16	7.6043	11.316	2 3/4	20.1946	30.054	4 1/8	45.438	67.620	6 1/4	104.31	155.231
19/64	.2354	.350	53/64	1.8313	2.725	1 23/32	7.8885	11.739	2 25/32	20.656	30.740	4 3/16	46.825	69.684	6 5/16	106.41	158.358
5/16	.2608	.388	27/64	1.9011	2.829	1 3/4	8.1780	12.170	2 13/16	21.123	31.435	4 1/4	48.233	71.779	6 3/8	108.53	161.513
21/64	.2875	.428	55/64	1.9721	2.935	1 25/32	8.4727	12.609	2 27/32	21.595	32.137	4 5/16	49.662	73.906	6 7/16	110.66	164.682
11/32	.3155	.470	7/8	2.0445	3.043	1 13/16	8.7725	13.055	2 7/8	22.072	32.847	4 3/8	51.112	76.064	6 1/2	112.82	167.896
23/64	.3449	.513	57/64	2.1182	3.152	1 27/32	9.0777	13.509	2 29/32	22.555	33.566	4 7/16	52.583	78.253	6 9/16	115.00	171.140
3/8	.3755	.559	29/32	2.1931	3.264	1 7/8	9.3880	13.971	2 15/16	23.042	34.292	4 1/2	54.075	80.474	6 5/8	117.20	174.415
25/64	.4075	.606	59/64	2.2694	3.377	1 29/32	9.7035	14.441	2 31/32	23.535	35.025	4 9/16	55.587	82.724	6 11/16	119.43	177.734
13/32	.4407	.656	15/16	2.3470	3.493	1 15/16	10.0243	14.918	3	24.033	35.766	4 5/8	57.121	85.006	6 3/4	121.67	181.067
27/64	.4753	.707	61/64	2.4259	3.610	1 31/32	10.3503	15.403	3 1/32	24.537	36.514	4 11/16	58.675	87.318	6 13/16	123.93	184.430
7/16	.5111	.759	31/32	2.5061	3.730	2	10.6814	15.896	3 1/16	25.045	37.271	4 3/4	60.250	89.662	6 7/8	126.22	187.839
29/64	.5483	.816	63/64	2.5876	3.851	2 1/32	11.0178	16.397	3 3/32	25.559	38.037	4 13/16	61.846	92.037	6 15/16	128.52	191.262
15/32	.5867	.873	1	2.6704	3.974	2 1/16	11.3595	16.905	3 1/8	26.078	38.809	4 7/8	63.463	94.443	7	130.85	194.729
31/64	.6265	.932	1 1/32	2.8399	4.226	2 3/32	11.7063	17.421	3 5/32	26.602	39.589	4 15/16	65.100	96.879	7 1/16	133.2	198.201
1/2	.6676	.994	1 1/16	3.0146	4.486	2 1/8	12.0583	17.945	3 3/16	27.131	40.376	5	66.759	99.848	7 1/8	135.6	201.772
33/64	.7100	1.057	1 3/32	3.1945	4.754	2 5/32	12.4156	18.476	3 7/32	27.666	41.172	5 1/16	68.438	101.848	7 3/16	138.0	205.344
17/32	.7536	1.121	1 1/8	3.3797	5.030	2 3/16	12.7781	19.016	3 1/4	28.206	41.976	5 1/8	70.139	104.379	7 1/4	140.4	208.915
35/64	.7986	1.188	1 5/32	3.5700	5.313	2 7/32	13.1458	19.564	3 9/32	28.751	42.787	5 3/16	71.860	106.940	7 5/16	142.8	212.486
9/16	.8449	1.257	1 3/16	3.7656	5.604	2 1/4	13.5187	20.119	3 5/16	29.301	43.606	5 1/4	73.602	109.533	7 3/8	145.2	216.057
37/64	.8925	1.328	1 7/32	3.9664	5.903	2 9/32	13.8968	20.682	3 11/32	29.856	44.432	5 5/16	75.365	112.156	7 7/16	147.7	219.777
19/32	.9414	1.401	1 1/4	4.1724	6.209	2 5/16	14.2802	21.252	3 3/8	30.417	45.266	5 3/8	77.148	114.809	7 1/2	150.2	223.497
39/64	.9916	1.476	1 9/32	4.3836	6.524	2 11/32	14.6687	21.830	3 13/32	30.983	46.108	5 7/16	78.953	117.495	7 9/16	152.7	227.217
5/8	1.0431	1.552	1 5/16	4.6001	6.846	2 3/8	15.0625	22.416	3 7/16	31.554	46.957	5 1/2	80.778	120.212	7 5/8	155.3	231.086
41/64	1.0959	1.631	1 11/32	4.8218	7.176	2 13/32	15.4615	23.010	3 15/32	32.130	47.814	5 9/16	82.625	122.959	7 11/16	157.8	234.806
21/32	1.1500	1.711	1 3/8	5.0486	7.513	2 7/16	15.8657	23.611	3 1/2	32.712	48.681	5 5/8	84.492	125.738	7 3/4	160.4	238.675
43/64	1.2054	1.794	1 13/32	5.2807	7.859	2 15/32	16.2751	24.220	3 9/16	33.891	50.436	5 11/16	86.380	128.547	7 13/16	163.0	242.544
11/16	1.2622	1.878	1 7/16	5.5180	8.212	2 1/2	16.6898	24.838	3 5/8	35.090	52.220	5 3/4	88.289	131.388	7 7/8	165.6	246.412
45/64	1.3202	1.965	1 15/32	5.7606	8.573	2 17/32	17.1096	25.462	3 11/16	36.311	54.037	5 13/16	90.22	134.263	7 15/16	168.2	250.281
23/32	1.3795	2.053	1 1/2	6.0083	8.941	2 9/16	17.5347	26.095	3 3/4	37.552	55.883	5 7/8	92.17	137.165	8	170.9	254.299
47/64	1.4401	2.143	1 17/32	6.2613	9.318	2 19/32	17.9650	26.735	3 13/16	38.814	57.761	5 15/16	94.14	140.097			

Bars over 8 inches in diameter can be furnished. To determine approximate weight in pounds per foot, multiply the diameter in inches by itself and multiply the result by 2.6704. To determine the approximate weight in kilos per meter, multiply the diameter in inches by itself and the result by 3.974.

HALF ROUND BARS

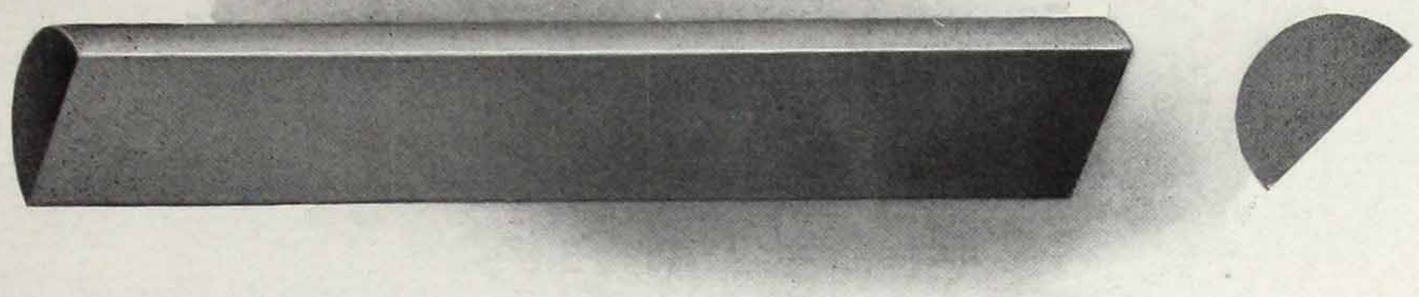


FIG. No. 4

SIZES AND WEIGHTS OF HALF ROUND BARS

Diameter, Inches	Pounds, per Foot	Kilos, per Meter	Diameter, Inches	Pounds, per Foot	Kilos, per Meter	Diameter, Inches	Pounds, per Foot	Kilos, per Meter	Diameter, Inches	Pounds, per Foot	Kilos, per Meter	Diameter, Inches	Pounds, per Foot	Kilos, per Meter	Diameter, Inches	Pounds, per Foot	Kilos, per Meter
5/16	.1304	.194	29/64	.2742	.408	19/32	.4707	.701	47/64	.7200	1.072	7/8	1.0223	1.522	1 1/16	2.7590	4.106
21/64	.1438	.219	15/32	.2934	.436	39/64	.4958	.738	3/4	.7501	1.118	15/16	1.1735	1.747	1 1/2	3.0042	4.470
11/32	.1578	.235	31/64	.3133	.466	5/8	.5215	.776	49/64	.7827	1.164	1	1.3352	1.987	1 9/16	3.2597	4.851
23/64	.1725	.257	1/2	.3338	.497	41/64	.5479	.815	25/32	.8150	1.213	1 1/16	1.5073	2.243	1 5/8	3.5257	5.247
3/8	.1978	.279	33/64	.3550	.528	21/32	.5750	.856	51/64	.8478	1.262	1 1/8	1.6899	2.515	1 11/16	3.8022	5.658
25/64	.2038	.303	17/32	.3768	.561	43/64	.6027	.897	13/16	.8830	1.312	1 3/16	1.8828	2.802	1 3/4	4.0890	6.085
13/32	.2204	.328	35/64	.3993	.594	11/16	.6311	.939	53/64	.9155	1.363	1 1/4	2.0862	3.104	2	5.3407	7.948
27/64	.2377	.354	9/16	.4225	.628	45/64	.6601	.983	27/32	.9505	1.430	1 5/16	2.3000	3.423	2 1/2	8.3449	12.419
7/16	.2555	.379	37/64	.4463	.664	23/32	.6898	1.026	55/64	.9860	1.468	1 3/8	2.5243	3.756	3	12.0170	17.883

Half Round Bars over 3″ in diameter can also be furnished. To determine their approximate weight, divide weight of corresponding size of Round Bar by 2.

HEXAGON BARS

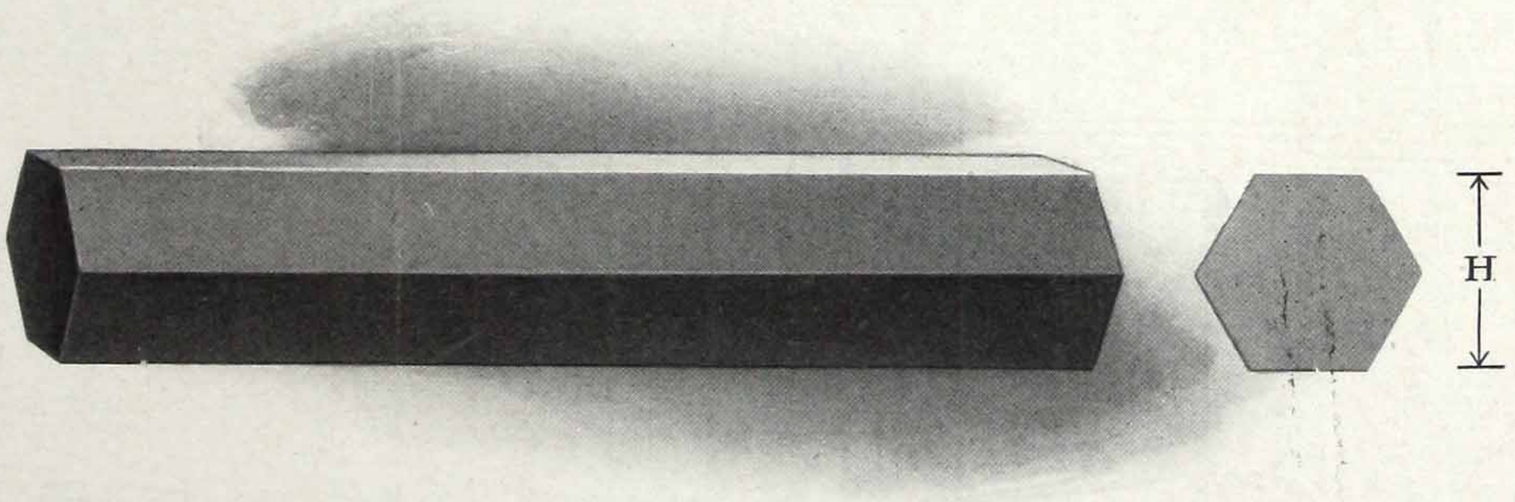


FIG. No. 5

SIZES AND WEIGHTS OF HEXAGON BARS

Size, H, Inches	Pounds, per Foot	Kilos, per Meter	Size, H, Inches	Pounds, per Foot	Kilos, per Meter	Size, H, Inches	Pounds, per Foot	Kilos, per Meter	Size, H, Inches	Pounds, per Foot	Kilos, per Meter	Size, H, Inches	Pounds, per Foot	Kilos, per Meter	Size, H, Inches	Pounds, per Foot	Kilos, per Meter
1/8	.0460	.0685	9/16	.9316	1.3864	1	2.9445	4.382	1 7/16	6.085	9.056	2 1/4	14.907	22.185	3 1/8	28.755	42.793
5/32	.0719	.1070	19/32	1.0380	1.5448	1 1/32	3.131	4.659	1 15/32	6.352	9.453	2 5/16	15.746	23.433	3 3/16	29.916	44.521
3/16	.1035	.1540	5/8	1.1502	1.7117	1 1/16	3.324	4.947	1 1/2	6.625	9.859	2 3/8	16.609	24.717	3 1/4	31.101	46.283
7/32	.1409	.2097	21/32	1.2681	1.8872	1 3/32	3.522	5.241	1 9/16	7.189	10.698	2 7/16	17.494	26.034	3 5/16	32.309	48.081
1/4	.1840	.2738	11/16	1.3917	2.0712	1 1/8	3.727	5.546	1 5/8	7.775	11.571	2 1/2	18.403	27.387	3 3/8	33.540	49.914
9/32	.2329	.3466	23/32	1.5211	2.2637	1 5/32	3.937	5.859	1 11/16	8.385	12.478	2 9/16	19.335	28.775	3 7/16	34.793	51.778
5/16	.2875	.4279	3/4	1.6563	2.4649	1 3/16	4.152	6.179	1 3/4	9.018	13.420	2 5/8	20.289	30.194	3 1/2	36.070	53.678
11/32	.3479	.5177	25/32	1.7972	2.6746	1 7/32	4.374	6.509	1 13/16	9.673	14.395	2 11/16	21.267	31.649	3 9/16	37.370	55.613
3/8	.4141	.6163	13/16	1.9438	2.8928	1 1/4	4.601	6.847	1 7/8	10.352	15.406	2 3/4	22.268	33.139	3 5/8	38.692	57.580
13/32	.4860	.7233	27/32	2.0962	3.1196	1 9/32	4.834	7.194	1 15/16	11.053	16.449	2 13/16	23.291	34.662	3 11/16	40.038	59.584
7/16	.5636	.8387	7/8	2.2544	3.3549	1 5/16	5.072	7.548	2	11.778	17.528	2 7/8	24.338	36.220	3 3/4	41.407	61.621
15/32	.6470	.9629	29/32	2.4183	3.5989	1 11/32	5.317	7.913	2 1/16	12.525	18.639	2 15/16	25.408	37.812	3 13/16	42.799	63.692
1/2	.7361	1.0954	15/16	2.5879	3.8513	1 3/8	5.567	8.285	2 1/8	13.296	19.788	3	26.500	39.437	3 7/8	44.213	65.797
17/32	.8310	1.2367	31/32	2.7633	4.1123	1 13/32	5.823	8.666	2 3/16	14.089	20.967	3 1/16	27.616	41.098	3 15/16	45.651	67.937
															4	47.112	70.111

Hexagon Bars over 4″ across faces can also be furnished.

OVAL BARS

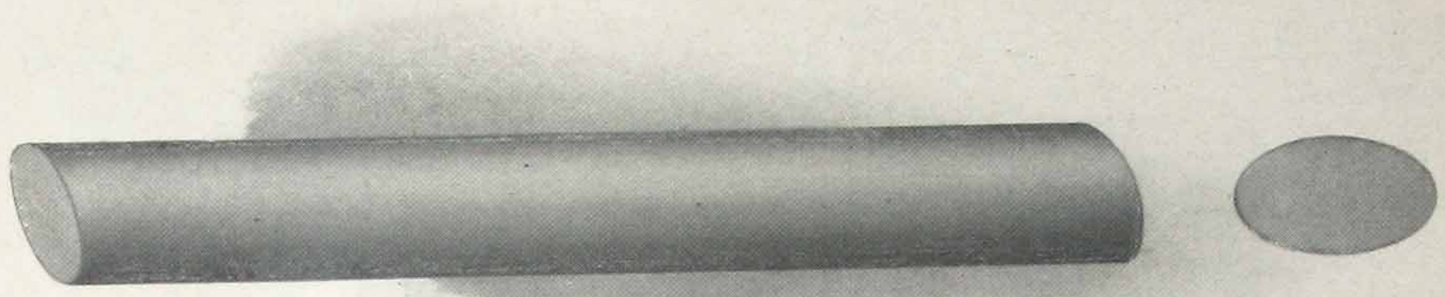


FIG. No. 6

SIZES AND WEIGHTS OF OVAL BARS

Width, Inches	Thickness, Inches	Pounds, Per Foot	Kilos, Per Meter	Width, Inches	Thickness, Inches	Pounds, Per Foot	Kilos, Per Meter
3/8	1/8	.109	.1622	13/16	9/16	1.130	1.6817
3/8	3/16	.167	.2485	7/8	1/4	.504	.7501
3/8	1/4	.230	.3423	7/8	5/16	.635	.9450
7/16	1/8	.126	.1875	7/8	3/8	.770	1.1459
7/16	3/16	.193	.2872	7/8	7/16	.909	1.3528
7/16	1/4	.264	.3929	7/8	1/2	1.054	1.5686
1/2	1/8	.143	.2128	7/8	9/16	1.203	1.7903
1/2	3/16	.218	.3244	7/8	5/8	1.358	2.0210
1/2	1/4	.297	.4420	15/16	1/4	.539	.8021
1/2	5/16	.380	.5655	15/16	5/16	.679	1.0105
1/2	3/8	.470	.6995	15/16	3/8	.822	1.2233
9/16	1/8	.161	.2396	15/16	7/16	.969	1.4421
9/16	3/16	.244	.3631	15/16	1/2	1.121	1.6683
9/16	1/4	.331	.4926	15/16	9/16	1.278	1.9019
9/16	5/16	.422	.6280	15/16	5/8	1.440	2.1430
9/16	3/8	.519	.7724	1	1/4	.574	.8542
9/16	7/16	.621	.9242	1	5/16	.722	1.0745
5/8	1/8	.179	.2664	1	3/8	.873	1.2992
5/8	3/16	.270	.4018	1	7/16	1.029	1.5314
5/8	1/4	.365	.5432	1	1/2	1.188	1.7680
5/8	5/16	.464	.6905	1	9/16	1.353	2.0135
5/8	3/8	.568	.8453	1	5/8	1.522	2.2650
5/8	7/16	.677	1.0075	1	11/16	1.697	2.5255
5/8	1/2	.792	1.1787	1	3/4	1.878	2.7948
11/16	3/16	.298	.4435	1 1/8	3/8	.977	1.4540
11/16	1/4	.399	.5938	1 1/8	7/16	1.149	1.7099
11/16	5/16	.507	.7545	1 1/8	1/2	1.324	1.9704
11/16	3/8	.618	.9197	1 1/8	9/16	1.504	2.2383
11/16	7/16	.724	1.0775	1 1/8	5/8	1.688	2.5121
11/16	1/2	.857	1.2754	1 1/8	11/16	1.878	2.7948
3/4	3/16	.319	.4747	1 1/8	3/4	2.073	3.0850
3/4	1/4	.435	.6474	1 1/8	13/16	2.275	3.3857
3/4	5/16	.550	.8185	1 1/8	7/8	2.482	3.6937
3/4	3/8	.668	.9941	1 1/4	3/8	1.082	1.6102
3/4	7/16	.792	1.1787	1 1/4	7/16	1.270	1.8900
3/4	1/2	.921	1.3706	1 1/4	1/2	1.461	2.1743
3/4	9/16	1.056	1.5715	1 1/4	9/16	1.657	2.4659
13/16	3/16	.349	.5194	1 1/4	5/8	1.857	2.7636
13/16	1/4	.469	.6980	1 1/4	11/16	2.061	3.0672
13/16	5/16	.593	.8825	1 1/4	3/4	2.271	3.3797
13/16	3/8	.719	1.0700	1 1/4	13/16	2.486	3.6997
13/16	7/16	.851	1.2665	1 1/4	7/8	2.708	4.0300
13/16	1/2	.987	1.4689				

HALF OVAL BARS

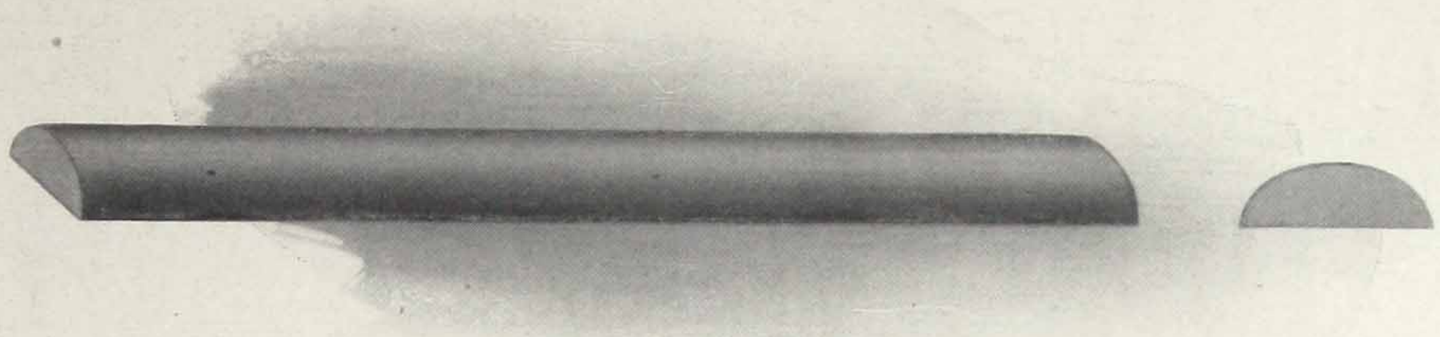


FIG. No. 7

SIZES AND WEIGHTS OF HALF OVAL BARS

Width, Inches	Thickness	Weight, Pounds	Weight, Kilos	Width, Inches	Thickness	Weight, Pounds	Weight, Kilos	Width, Inches	Thickness	Weight, Pounds	Weight, Kilos
3/8	#15	.063	.094	1	12	.249	.371	2 1/4	5/8	3.377	5.025
3/8	#14	.073	.109	1	1/8	.287	.427	2 1/4	11/16	3.755	5.588
3/8	#13	.085	.126	1	3/16	.437	.650	2 1/4	3/4	4.147	6.172
3/8	#12	.099	.147	1	1/4	.594	.884	2 1/2	1/4	1.428	2.125
3/8	1/8	.115	.171	1	5/16	.761	1.133	2 1/2	5/16	1.793	2.668
7/16	#15	.073	.109	1	3/8	.939	1.397	2 1/2	3/8	2.163	3.219
7/16	#14	.085	.126	1 1/8	1/8	.322	.479	2 1/2	7/16	2.539	3.779
7/16	#13	.098	.146	1 1/8	3/16	.489	.728	2 1/2	1/2	2.922	4.349
7/16	#12	.113	.168	1 1/8	1/4	.662	.985	2 1/2	9/16	3.313	4.930
7/16	1/8	.132	.196	1 1/8	5/16	.843	1.255	2 1/2	5/8	3.713	5.526
7/16	3/16	.211	.314	1 1/8	3/8	1.037	1.543	2 1/2	11/16	4.122	6.134
1/2	#14	.096	.143	1 1/4	1/8	.357	.531	2 1/2	3/4	4.542	6.759
1/2	#13	.111	.165	1 1/4	3/16	.541	.805	2 3/4	5/16	1.968	2.929
1/2	#12	.128	.190	1 1/4	1/4	.731	1.088	2 3/4	3/8	2.371	3.529
1/2	1/8	.149	.222	1 1/4	5/16	.928	1.381	2 3/4	7/16	2.781	4.139
1/2	3/16	.235	.350	1 1/4	3/8	1.136	1.691	2 3/4	1/2	3.198	4.759
9/16	#14	.108	.161	1 3/8	1/8	.392	.583	2 3/4	9/16	3.621	5.389
9/16	#13	.124	.185	1 3/8	3/16	.593	.883	2 3/4	5/8	4.053	6.032
9/16	#12	.143	.213	1 3/8	1/4	.800	1.191	2 3/4	11/16	4.492	6.685
9/16	1/8	.166	.247	1 3/8	5/16	1.013	1.508	2 3/4	3/4	4.943	7.356
9/16	3/16	.259	.385	1 3/8	3/8	1.236	1.839	3	5/16	2.144	3.191
9/16	1/4	.365	.543	1 1/2	1/8	.427	.635	3	3/8	2.582	3.843
5/8	#14	.119	.177	1 1/2	3/16	.645	.960	3	7/16	3.025	4.502
5/8	#13	.137	.204	1 1/2	1/4	.869	1.293	3	1/2	3.475	5.171
5/8	#12	.158	.235	1 1/2	5/16	1.099	1.636	3	9/16	3.930	5.849
5/8	1/8	.183	.272	1 1/2	3/8	1.337	1.990	3	5/8	4.394	6.539
5/8	3/16	.284	.423	1 1/2	7/16	1.584	2.357	3	11/16	4.866	7.242
5/8	1/4	.396	.589	1 1/2	1/2	1.843	2.743	3	3/4	5.347	7.957
11/16	#14	.131	.195	1 5/8	3/16	.698	1.039	3 1/4	5/16	2.319	3.451
11/16	#13	.150	.223	1 5/8	1/4	.938	1.396	3 1/4	3/8	2.972	4.423
11/16	#12	.173	.257	1 5/8	5/16	1.185	1.764	3 1/4	7/16	3.269	4.865
11/16	1/8	.200	.298	1 5/8	3/8	1.439	2.142	3 1/4	1/2	3.752	5.584
11/16	3/16	.309	.460	1 5/8	7/16	1.701	2.531	3 1/4	9/16	4.242	6.313
11/16	1/4	.428	.637	1 5/8	1/2	1.974	2.938	3 1/4	5/8	4.738	7.051
3/4	#14	.143	.213	1 3/4	1/4	1.008	1.500	3 1/4	11/16	5.241	7.800
3/4	#13	.164	.244	1 3/4	5/16	1.271	1.892	3 1/4	3/4	5.754	8.563
3/4	#12	.188	.280	1 3/4	3/8	1.541	2.293	3 1/2	5/16	2.495	3.713
3/4	1/8	.217	.323	1 3/4	7/16	1.819	2.707	3 1/2	3/8	3.002	4.468
3/4	3/16	.334	.497	1 3/4	1/2	2.108	3.137	3 1/2	7/16	3.541	5.270
3/4	1/4	.460	.685	1 7/8	1/4	1.077	1.603	3 1/2	1/2	4.031	5.999
3/4	5/16	.599	.891	1 7/8	5/16	1.357	2.019	3 1/2	9/16	4.553	6.776
13/16	#12	.204	.304	1 7/8	3/8	1.644	2.447	3 1/2	5/8	5.083	7.565
13/16	1/8	.235	.350	1 7/8	7/16	1.938	2.884	3 1/2	11/16	5.618	8.361
13/16	3/16	.359	.534	1 7/8	1/2	2.242	3.337	3 1/2	3/4	6.164	9.173
13/16	1/4	.494	.735	1 7/8	9/16	2.555	3.802	3 3/4	5/16	2.671	3.975
13/16	5/16	.639	.951	2	1/4	1.147	1.707	3 3/4	3/8	3.213	4.782
7/8	#12	.219	.326	2	5/16	1.444	2.149	3 3/4	7/16	3.759	5.594
7/8	1/8	.252	.375	2	3/8	1.747	2.599	3 3/4	1/2	4.310	6.414
7/8	3/16	.385	.573	2	7/16	2.058	3.063	3 3/4	9/16	4.866	7.242
7/8	1/4	.527	.784	2	1/2	2.376	3.536	3 3/4	5/8	5.429	8.079
7/8	5/16	.679	1.010	2	9/16	2.705	4.026	3 3/4	11/16	5.997	8.925
7/8	3/8	.844	1.256	2	5/8	3.043	4.533	3 3/4	3/4	6.574	9.783
15/16	#12	.234	.348	2 1/4	1/4	1.288	1.917	4	3/8	3.424	5.096
15/16	1/8	.269	.400	2 1/4	5/16	1.618	2.408	4	7/16	4.005	5.960
15/16	3/16	.411	.612	2 1/4	3/8	1.955	2.909	4	1/2	4.589	6.829
15/16	1/4	.560	.833	2 1/4	7/16	2.297	3.418	4	9/16	5.180	7.709
15/16	5/16	.720	1.071	2 1/4	1/2	2.648	3.941	4	5/8	5.766	8.581
15/16	3/8	.891	1.326	2 1/4	9/16	3.007	4.475	4	11/16	6.379	9.493
								4	3/4	6.987	10.398

SQUARE EDGE FLAT BARS

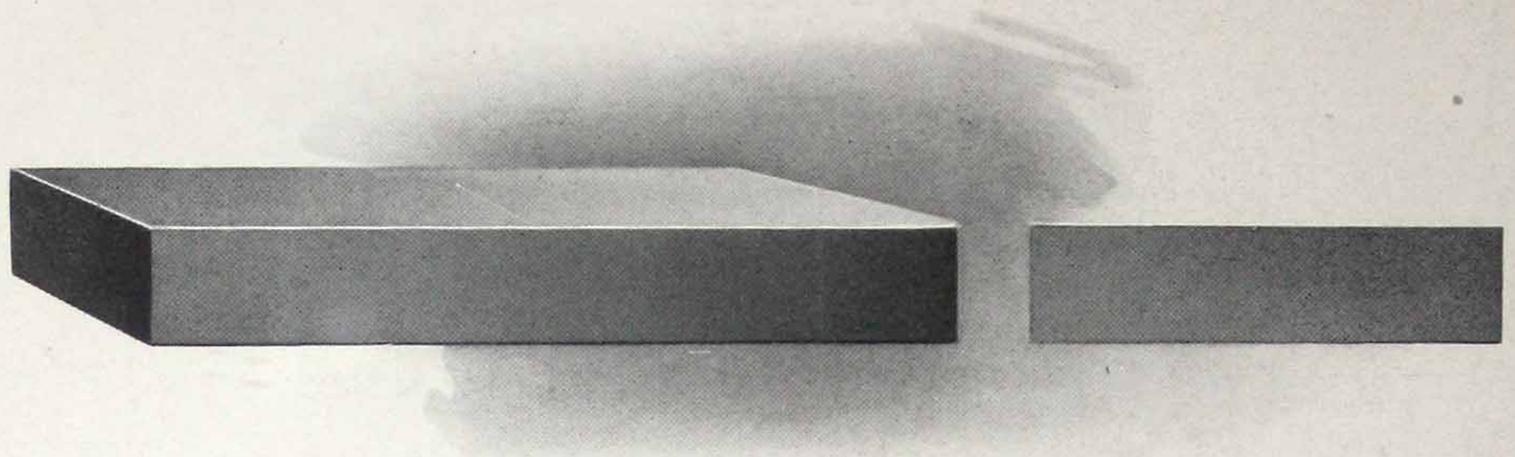


FIG. No. 8

SIZES AND WEIGHTS OF FLAT BARS

Size, Inches	Per Foot, Pounds	Per Meter, Kilos	Size, Inches	Per Foot, Pounds	Per Meter, Kilos	Size, Inches	Per Foot, Pounds	Per Meter, Kilos
3/8 x 1/8	.1594	.2372	1 3/4 x 1/8	.744	1.107	2 1/2 x 2	17.000	25.299
3/8 x 1/4	.3188	.4744	1 3/4 x 1/4	1.488	2.214	2 1/2 x 2 1/4	19.125	28.462
1/2 x 1/8	.2125	.3163	1 3/4 x 3/8	2.231	3.321	2 3/4 x 1/8	1.169	1.739
1/2 x 1/4	.4250	.6325	1 3/4 x 1/2	2.975	4.427	2 3/4 x 1/4	2.338	3.479
1/2 x 3/8	.6375	.9487	1 3/4 x 5/8	3.719	5.535	2 3/4 x 3/8	3.506	5.218
5/8 x 1/8	.2656	.3953	1 3/4 x 3/4	4.463	6.641	2 3/4 x 1/2	4.675	6.957
5/8 x 1/4	.5313	.7906	1 3/4 x 7/8	5.206	7.748	2 3/4 x 5/8	5.844	8.697
5/8 x 3/8	.7969	1.1859	1 3/4 x 1	5.950	8.855	2 3/4 x 3/4	7.013	10.436
5/8 x 1/2	1.0625	1.5812	1 3/4 x 1 1/4	7.438	11.069	2 3/4 x 7/8	8.181	12.175
3/4 x 1/8	.3188	.4744	1 3/4 x 1 1/2	8.925	13.282	2 3/4 x 1	9.350	13.915
3/4 x 1/4	.6375	.9487	2 x 1/8	.850	1.265	2 3/4 x 1 1/4	11.688	17.393
3/4 x 3/8	.9563	1.4231	2 x 1/4	1.700	2.530	2 3/4 x 1 1/2	14.025	20.872
3/4 x 1/2	1.2750	1.8975	2 x 3/8	2.550	3.795	2 3/4 x 1 3/4	16.363	24.350
3/4 x 5/8	1.5938	2.3719	2 x 1/2	3.400	5.060	2 3/4 x 2	18.700	27.829
7/8 x 1/8	.3719	.5534	2 x 5/8	4.250	6.325	2 3/4 x 2 1/4	21.038	31.308
7/8 x 1/4	.7438	1.1068	2 x 3/4	5.100	7.590	2 3/4 x 2 1/2	23.375	34.786
7/8 x 3/8	1.1156	1.6603	2 x 7/8	5.950	8.855	3 x 1/8	1.275	1.897
7/8 x 1/2	1.4875	2.2137	2 x 1	6.800	10.120	3 x 1/4	2.550	3.795
7/8 x 5/8	1.8594	2.7671	2 x 1 1/4	8.500	12.650	3 x 3/8	3.825	5.692
7/8 x 3/4	2.2313	3.3205	2 x 1 1/2	10.200	15.180	3 x 1/2	5.100	7.590
1 x 1/8	.4250	.6325	2 x 1 3/4	11.900	17.709	3 x 5/8	6.375	9.487
1 x 1/4	.8500	1.2650	2 1/4 x 1/8	.956	1.423	3 x 3/4	7.650	11.385
1 x 3/8	1.2750	1.8975	2 1/4 x 1/4	1.913	2.846	3 x 7/8	8.925	13.282
1 x 1/2	1.7000	2.5300	2 1/4 x 3/8	2.869	4.269	3 x 1	10.200	15.180
1 x 5/8	2.1250	3.1625	2 1/4 x 1/2	3.825	5.692	3 x 1 1/4	12.750	18.974
1 x 3/4	2.5500	3.7949	2 1/4 x 5/8	4.781	7.115	3 x 1 1/2	15.300	22.769
1 x 7/8	2.9750	4.4275	2 1/4 x 3/4	5.738	8.539	3 x 1 3/4	17.850	26.564
1 1/4 x 1/8	.5313	.7906	2 1/4 x 7/8	6.694	9.962	3 x 2	20.400	30.359
1 1/4 x 1/4	1.0625	1.5812	2 1/4 x 1	7.650	11.385	3 x 2 1/4	22.950	34.154
1 1/4 x 3/8	1.5938	2.3718	2 1/4 x 1 1/4	9.563	14.231	3 x 2 1/2	25.500	37.949
1 1/4 x 1/2	2.1250	3.1624	2 1/4 x 1 1/2	11.475	17.077	3 x 2 3/4	28.050	41.743
1 1/4 x 5/8	2.6563	3.9530	2 1/4 1 3/4	13.388	19.923	3 1/4 x 1/4	2.763	4.111
1 1/4 x 3/4	3.1875	4.7435	2 1/4 x 2	15.300	22.769	3 1/4 x 3/8	4.144	6.167
1 1/4 x 7/8	3.7188	5.5342	2 1/2 x 1/8	1.063	1.581	3 1/4 x 1/2	5.525	8.222
1 1/4 x 1	4.2500	6.3248	2 1/2 x 1/4	2.125	3.162	3 1/4 x 5/8	6.906	10.278
1 1/2 x 1/8	.6375	.9487	2 1/2 x 3/8	3.188	4.744	3 1/4 x 3/4	8.288	12.333
1 1/2 x 1/4	1.2750	1.8974	2 1/2 x 1/2	4.250	6.325	3 1/4 x 7/8	9.669	14.389
1 1/2 x 3/8	1.9125	2.8461	2 1/2 x 5/8	5.313	7.906	3 1/4 x 1	11.050	16.444
1 1/2 x 1/2	2.5500	3.7949	2 1/2 x 3/4	6.375	9.487	3 1/4 x 1 1/4	13.813	20.556
1 1/2 x 5/8	3.1875	4.7435	2 1/2 x 7/8	7.438	11.069	3 1/4 x 1 1/2	16.675	24.667
1 1/2 x 3/4	3.8250	5.6922	2 1/2 x 1	8.500	12.650	3 1/4 x 1 3/4	19.338	28.778
1 1/2 x 7/8	4.4625	6.6410	2 1/2 x 1 1/4	10.625	15.812	3 1/4 x 2	22.100	32.889
1 1/2 x 1	5.1000	7.5897	2 1/2 x 1 1/2	12.750	18.975	3 1/4 x 2 1/4	24.863	37.000
1 1/2 x 1 1/4	6.3750	9.4871	2 1/2 x 1 3/4	14.875	22.137	3 1/4 x 2 1/2	27.625	41.111

SQUARE EDGE FLAT BARS—*(Continued)*

SIZES AND WEIGHTS OF FLAT BARS

Size, Inches	Pounds, Per Foot	Kilos, Per Meter	Size, Inches	Pounds, Per Foot	Kilos, Per Meter	Size, Inches	Pounds, Per Foot	Kilos, Per Meter
3¼ x 2¾	30.388	45.222	4 x 1¾	23.800	35.419	5½ x ¾	14.025	20.872
3¼ x 3	33.150	49.333	4 x 2	27.200	40.479	5½ x ⅞	16.363	24.350
3½ x ¼	2.975	4.427	4 x 2¼	30.600	45.539	5½ x 1	18.700	27.829
3½ x ⅜	4.463	6.641	4 x 2½	34.000	50.598	5½ x 1¼	23.375	34.786
3½ x ½	5.950	8.855	4 x 2¾	37.400	55.658	5½ x 1½	28.050	41.743
3½ x ⅝	7.438	11.068	4 x 3	40.800	60.717	5½ x 1¾	32.725	48.701
3½ x ¾	8.925	13.282	4½ x ¼	3.825	5.692	5½ x 2	37.400	55.658
3½ x ⅞	10.413	15.496	4½ x ⅜	5.738	8.539	6 x ¼	5.100	7.590
3½ x 1	11.900	17.710	4½ x ½	7.650	11.385	6 x ⅜	7.650	11.385
3½ x 1¼	14.875	22.137	4½ x ⅝	9.563	14.231	6 x ½	10.200	15.180
3½ x 1½	17.850	26.564	4½ x ¾	11.475	17.077	6 x ⅝	12.750	18.974
3½ x 1¾	20.825	30.992	4½ x ⅞	13.388	19.923	6 x ¾	15.300	22.769
3½ x 2	23.800	35.419	4½ x 1	15.300	22.769	6 x ⅞	17.850	26.564
3½ x 2¼	26.775	39.847	4½ x 1¼	19.125	28.462	6 x 1	20.400	30.359
3½ x 2½	29.750	44.274	4½ x 1½	22.950	34.154	6 x 1¼	25.500	37.949
3½ x 2¾	32.725	48.701	4½ x 1¾	26.775	39.846	6 x 1½	30.600	45.538
3½ x 3	35.700	53.128	4½ x 2	30.600	45.538	6 x 1¾	35.700	53.128
3¾ x ¼	3.188	4.744	4½ x 2¼	34.425	51.230	6 x 2	40.800	60.717
3¾ x ⅜	4.781	7.115	4½ x 2½	38.250	56.922	6½ x ¼	5.525	8.222
3¾ x ½	6.375	9.487	4½ x 2¾	42.075	62.615	6½ x ⅜	8.288	12.333
3¾ x ⅝	7.969	11.859	4½ x 3	45.900	68.307	6½ x ½	11.050	16.444
3¾ x ¾	9.563	14.230	5 x ¼	4.250	6.325	6½ x ⅝	13.813	20.556
3¾ x ⅞	11.156	16.602	5 x ⅜	6.375	9.488	6½ x ¾	16.575	24.667
3¾ x 1	12.750	18.974	5 x ½	8.500	12.650	6½ x ⅞	19.338	28.778
3¾ x 1¼	15.938	23.718	5 x ⅝	10.625	15.813	6½ x 1	22.100	32.889
3¾ x 1½	19.125	28.462	5 x ¾	12.750	18.975	6½ x 1¼	27.625	41.111
3¾ x 1¾	22.313	33.205	5 x ⅞	14.875	22.137	6½ x 1½	33.150	49.333
3¾ x 2	25.500	37.949	5 x 1	17.000	25.299	6½ x 1¾	38.675	57.555
3¾ x 2¼	28.688	42.692	5 x 1¼	21.250	31.624	6½ x 2	44.200	65.778
3¾ x 2½	31.875	47.435	5 x 1½	25.500	37.949	7 x ¼	5.950	8.855
3¾ x 2¾	35.063	52.179	5 x 1¾	29.750	44.274	7 x ⅜	8.925	13.282
3¾ x 3	38.250	56.922	5 x 2	34.000	50.598	7 x ½	11.900	17.710
4 x ¼	3.400	5.060	5 x 2¼	38.250	56.923	7 x ⅝	14.875	22.137
4 x ⅜	5.100	7.590	5 x 2½	42.500	63.248	7 x ¾	17.850	26.564
4 x ½	6.800	10.120	5 x 2¾	46.750	69.572	7 x ⅞	20.825	30.992
4 x ⅝	8.500	12.650	5 x 3	51.000	75.897	7 x 1	23.800	35.419
4 x ¾	10.200	15.180	5½ x ¼	4.675	6.957	7 x 1¼	29.750	44.274
4 x ⅞	11.900	17.710	5½ x ⅜	7.013	10.436	7 x 1½	35.700	53.128
4 x 1	13.600	20.240	5½ x ½	9.350	13.915	7 x 1¾	41.650	61.982
4 x 1¼	17.000	25.299	5½ x ⅝	11.688	17.393	7 x 2	47.600	70.837
4 x 1½	20.400	30.359						

To determine the weight per foot of any size not given in the above table, multiply the width in inches by the thickness in inches and the resulting product by 3.4 for pounds per foot or by 5.06 for kilos per meter.

ROUND EDGE FLAT BARS

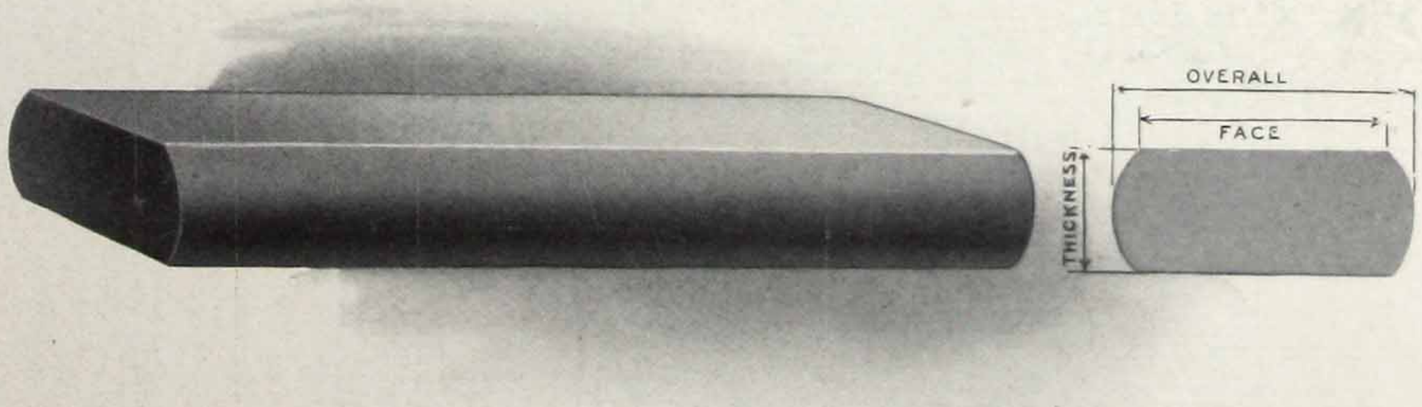


FIG. No. 9

Weights per foot approximately 5 per cent. less than those given for square edge flats.

STEEL BARS
FOR CONCRETE REINFORCEMENT

SQUARE TWISTED BARS

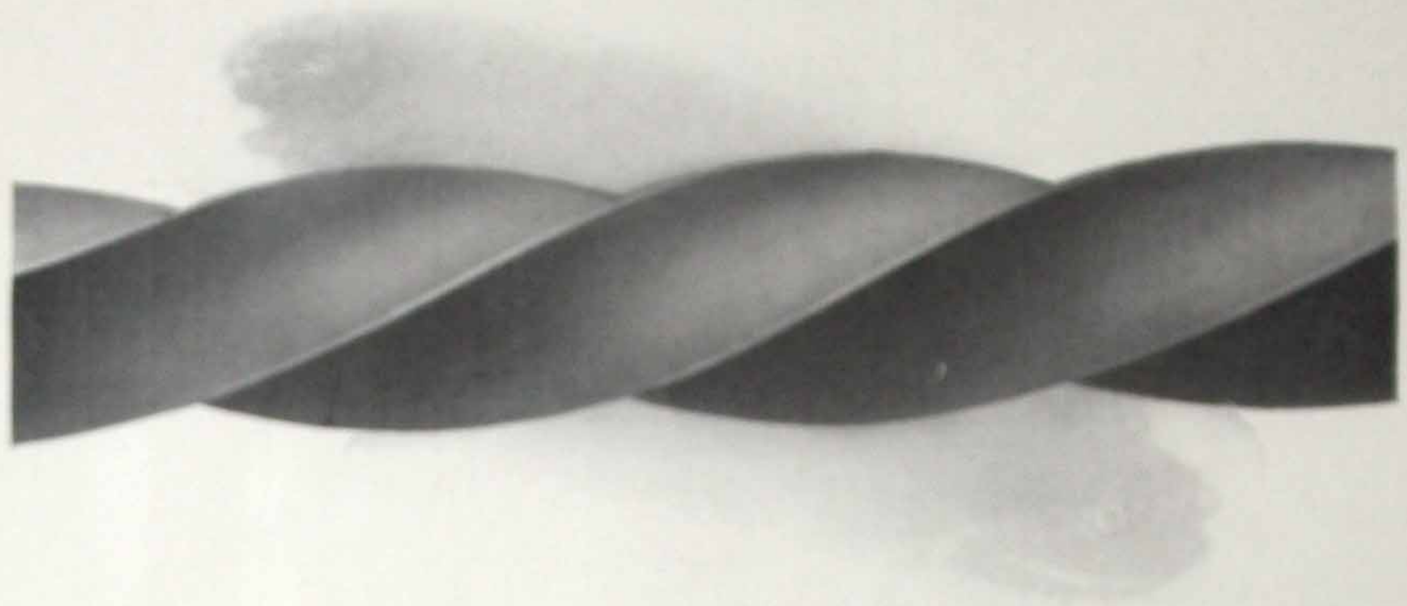


FIG. No. 10

Weights of square twisted bars are the same as plain square bars of same size. See Table on page 303.

Twisted bars rolled from billet steel are cold twisted; rolled from rail steel they are hot twisted.

Unless otherwise specified, twisted bars will be cold twisted, structural grade, rolled from billet steel, and conforming to the standard specifications of the American Society for Testing Materials.

DEFORMED BARS

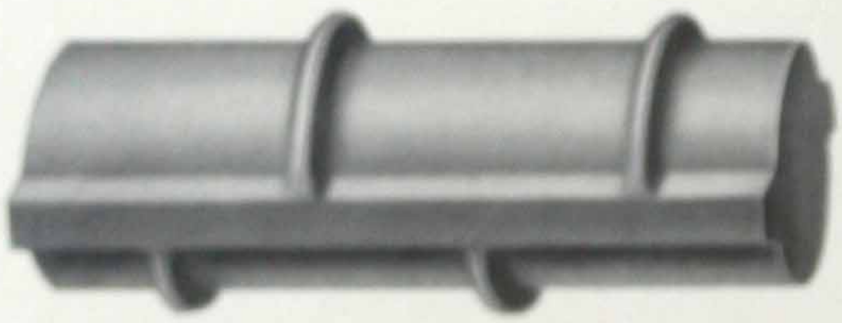


FIG. No. 11

FIG. No. 12

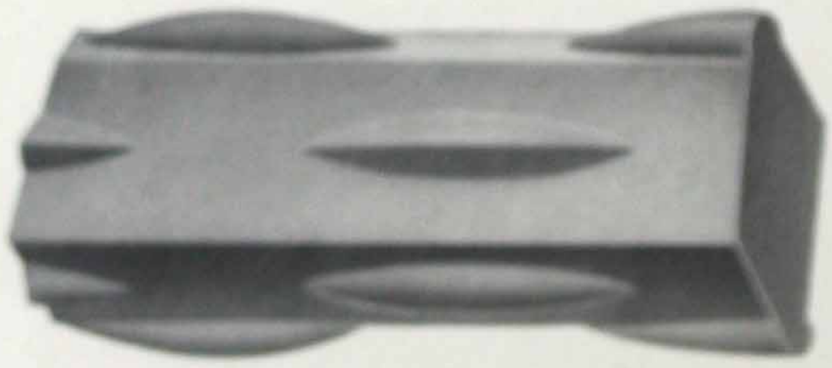


FIG. No. 13

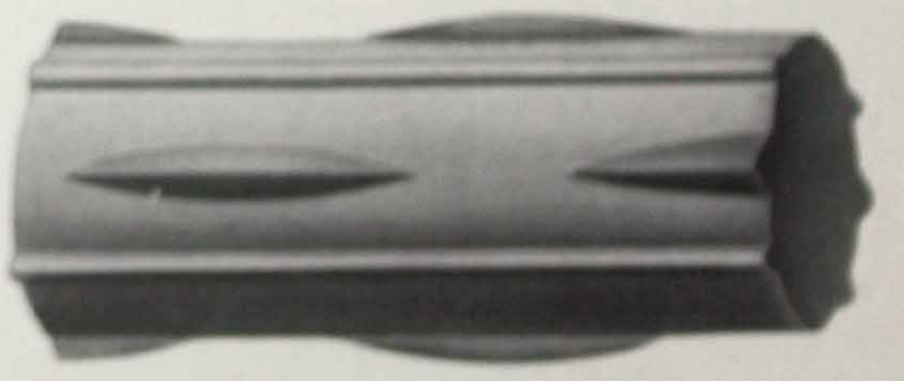


FIG. No. 14

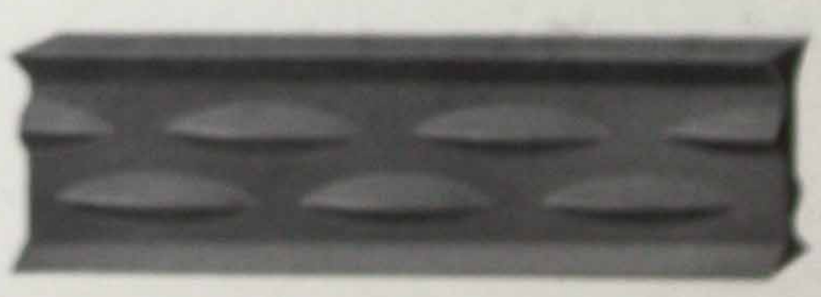


FIG. No. 15

STEEL BARS
FOR CONCRETE REINFORCEMENT
(Continued)

DEFORMED BARS
(Continued)

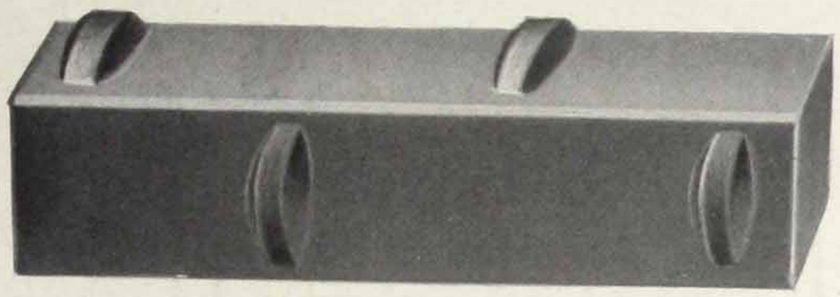


FIG. No. 16

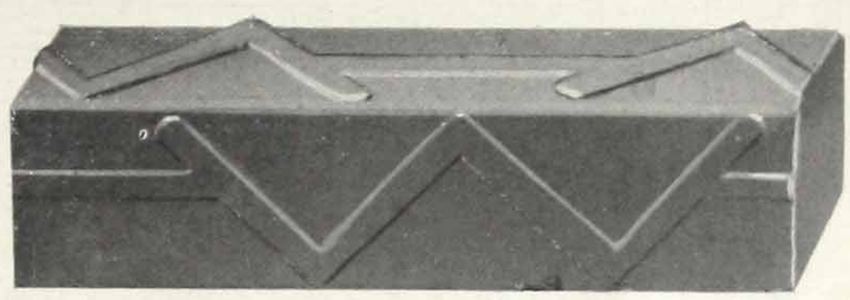


FIG. No. 17

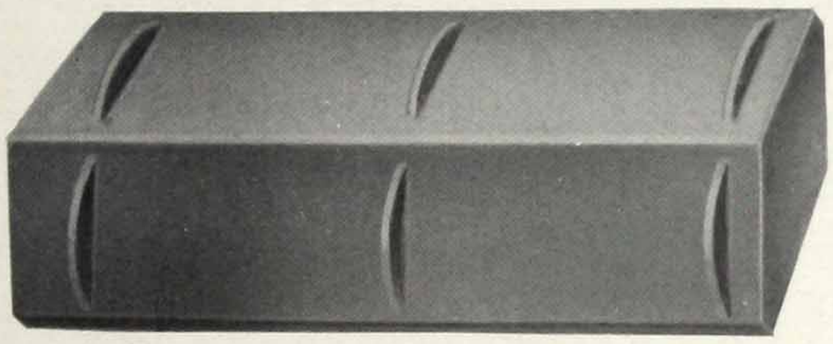


FIG. No. 18

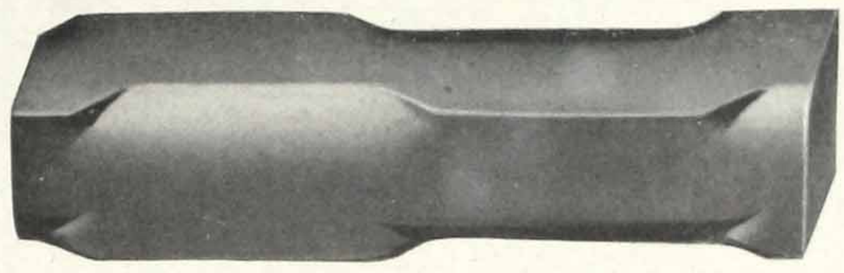


FIG. No. 19

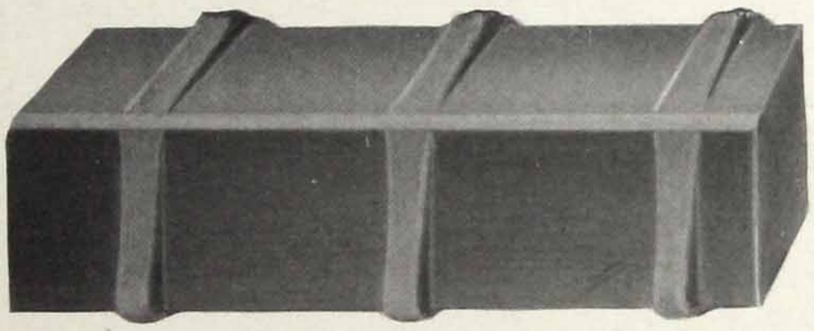


FIG. No. 20

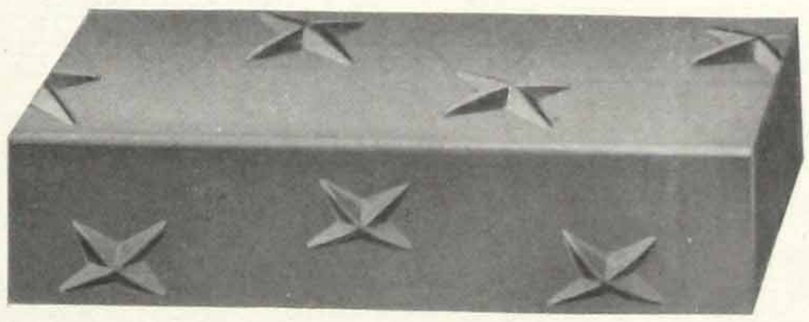


FIG. No. 21

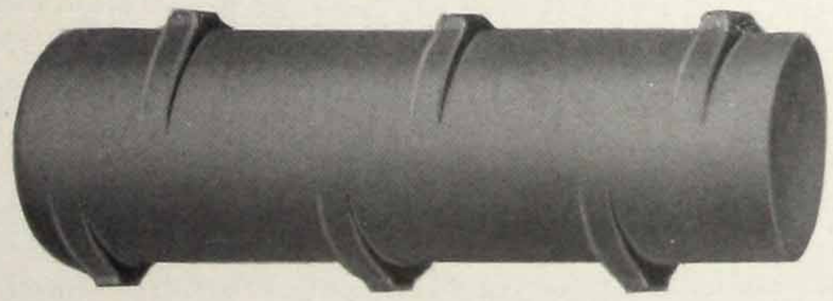


FIG. No. 22

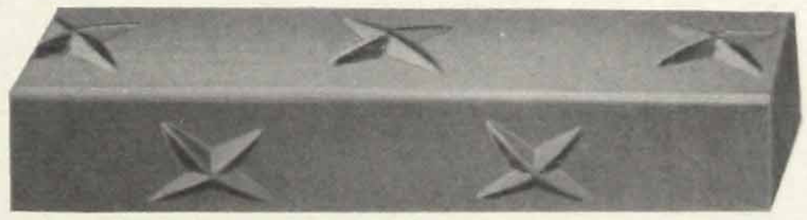


FIG. No. 23

Approximate weights of deformed bars may be determined by referring to the Table on page 303 for squares and page 304 for rounds.

We are in a position to supply varied types of deformed bars, though not illustrated on these pages. Any type can be rolled and we will be glad to quote upon receipt of detailed specifications.

Deformed bars are rolled from either billet, rail or shell discard steel. Unless otherwise specified, structural steel grade rolled from new billets, and conforming to standard specifications of the American Society for Testing Materials, will be supplied.

STEEL BARS FOR THE MANUFACTURE OF TOOLS

While concrete reinforcing steel bars are generally used as such, many markets use plain and deformed reinforcing steel bars for the manufacture of crowbars, cheap chisels and similar tools. In some localities of the Far East, such bars are known as Bamboo Steel, while in other localities the term signifies a grade of high carbon tool steel. We are ready to quote on bars for the manufacture of tools, but in all cases we should be advised as to the type of tools into which the bars are to be made and any special packing that may be required.

Reinforcing bars made from new billets will always be supplied to conform to the following:

STANDARD SPECIFICATIONS

ADOPTED BY THE AMERICAN SOCIETY FOR TESTING MATERIALS

FOR BILLET-STEEL CONCRETE REINFORCEMENT BARS

Classes.

1. (*a*) These specifications cover three classes of billet-steel concrete reinforcement bars, namely: Plain, deformed, and cold-twisted.

(*b*) Plain and deformed bars are of three grades, namely: Structural-steel, intermediate and hard.

Basis of Purchase.

2. (*a*) The structural-steel grade shall be used unless otherwise specified.

(*b*) If desired, cold-twisted bars may be purchased on the basis of tests of the hot-rolled bars before twisting, in which case such tests shall govern and shall conform to the requirements specified for plain bars of structural-steel grade.

I. MANUFACTURE

Process.

3. (*a*) The steel may be made by the Bessemer or open-hearth process.

(*b*) The bars shall be rolled from new billets. No rerolled material will be accepted.

Cold-twisted Bars.

4. Cold-twisted bars shall be twisted cold, with one complete twist in a length not over twelve times the thickness of the bar.

II. CHEMICAL PROPERTIES AND TESTS

Chemical Composition.

5. The steel shall conform to the following requirements as to chemical composition:

Phosphorus	Bessemer	not over 0.10 per cent
	Open-hearth	" " 0.05 "

Ladle Analysis.

6. An analysis of each melt of steel shall be made by the manufacturer to determine the percentages of carbon, manganese, phosphorus and sulfur. This analysis shall be made from a test ingot taken during the pouring of the melt. The chemical composition thus determined shall be reported to the purchaser or his representative, and shall conform to the requirements specified in Section 5.

Check Analysis.

7. Analysis may be made by the purchaser from finished bars representing each melt of open-hearth steel, and each melt, or lot of ten tons, of Bessemer steel. The phosphorus content thus determined shall not exceed that specified in Section 5 by more than 25 per cent.

III. PHYSICAL PROPERTIES AND TESTS

Tension Tests.

8. (*a*) The bars shall conform to the following requirements as to tensile properties:

TENSILE PROPERTIES

Properties Considered	Plain Bars			Deformed Bars			Cold-twisted Bars
	Structural-Steel Grade	Intermediate Grade	Hard Grade	Structural-Steel Grade	Intermediate Grade	Hard Grade	
Tensile strength, lb. per sq. in.....	55,000 to 70,000	70,000 to 85,000	80,000 min.	55,000 to 70,000	70,000 to 85,000	80,000 min.	Recorded only.
Yield point, min., lb. per sq. in....	33,000	40,000	50,000	33,000	40,000	50,000	55,000
Elongation in 8 in., min., per cent..	1,400,000*a* / Tens. str.	1,300,000*a* / Tens. str.	1,200,000*a* / Tens. str.	1,250,000*a* / Tens. str.	1,125,000*a* / Tens. str.	1,000,000*a* / Tens. str.	5

a See Section 9.

Modifications in Elongation.

(*b*) The yield point shall be determined by the drop of the beam of the testing machine.

9. (*a*) For plain and deformed bars over ¾ inch in thickness or diameter, a deduction of 1 from the percentages of elongation specified in Section 8 (*a*) shall be made for each increase of ⅛ inch in thickness or diameter above ¾ inch.

(*b*) For plain and deformed bars under 7/16 inch in thickness or diameter, a deduction of 1 from the percentages of elongation specified in Section 8 (*a*) shall be made for each decrease of 1/16 inch in thickness or diameter below 7/16 inch.

Bend Tests.

10. The test specimen shall bend cold around a pin without cracking on the outside of the bent portion, as follows:

BEND-TEST REQUIREMENTS

Thickness or Diameter of Bar	Plain Bars			Deformed Bars			Cold-twisted Bars
	Structural-Steel Grade	Intermediate Grade	Hard Grade	Structural-Steel Grade	Intermediate Grade	Hard Grade	
Under ¾ in.....	180 deg. d = t	180 deg. d = 2t	180 deg. d = 3t	180 deg. d = t	180 deg. d = 3t	180 deg. d = 4t	180 deg. d = 2t
¾ in. or over.....	180 deg. d = t	90 deg. d = 2t	90 deg. d = 3t	180 deg. d = 2t	90 deg. d = 3t	90 deg. d = 4t	180 deg. d = 3t

Explanatory Note.—d = the diameter of pin about which the specimen is bent;
t = the thickness or diameter of the specimen.

Test Specimens.

11. (*a*) Tension and bend test specimens for plain and deformed bars shall be taken from the finished bars, and shall be of the full thickness or diameter of bars as rolled; except that the specimens for deformed bars may be machined for a length of at least 9 inches, if deemed necessary by the manufacturer to obtain uniform cross-section.

(*b*) Tension and bend test specimens for cold-twisted bars shall be taken from the finished bars, without further treatment; except as specified in Section 2 (*b*).

Number of Tests.

12. (*a*) One tension and one bend test shall be made from each melt of open-hearth steel, and from each melt, or lot of ten tons, of Bessemer steel; except that if material from one melt differs ⅜ inch or more in thickness or diameter, one tension and one bend test shall be made from both the thickest and the thinnest material rolled.

(*b*) If any test specimen shows defective machining or develops flaws, it may be discarded and another specimen substituted.

(*c*) If the percentage of elongation of any tension test specimen is less than that specified in Section 8 (*a*) and any part of the fracture is outside the middle third of the gage length, as indicated by scribe scratches marked on the specimen before testing, a retest shall be allowed.

Permissible Variations.

IV. PERMISSIBLE VARIATIONS IN WEIGHT

13. The weight of any lot of bars shall not vary more than 5 per cent from the theoretical weight of that lot.

V. FINISH

Finish.

14. The finished bars shall be free from injurious defects and shall have a workmanlike finish.

VI. INSPECTION AND REJECTION

Inspection.

15. The inspector representing the purchaser shall have free entry, at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the manufacture of the bars ordered. The manufacturer shall afford the inspector, free of cost, all reasonable facilities to satisfy him that the bars are being furnished in accordance with these specifications. All tests (except check analysis) and inspection shall be made at the place of manufacture prior to shipment, unless otherwise specified, and shall be so conducted as not to interfere unnecessarily with the operation of the works.

Rejection.

16. (*a*) Unless otherwise specified, any rejection based on tests made in accordance with Section 7 shall be reported within five working days from the receipt of samples.

(*b*) Bars which show injurious defects subsequent to their acceptance at the manufacturer's works will be rejected, and the manufacturer shall be notified.

Rehearing.

17. Samples tested in accordance with Section 7, which represent rejected bars, shall be preserved for two weeks from the date of the test report. In case of dissatisfaction with the results of the tests, the manufacturer may make claim for a rehearing within that time.

Concrete reinforcing bars, when ordered to be rolled from rail steel, will conform to the following:

STANDARD SPECIFICATIONS

ADOPTED BY THE AMERICAN SOCIETY FOR TESTING MATERIALS

FOR RAIL-STEEL CONCRETE REINFORCEMENT BARS

Classes.

1. These specifications cover three classes of rail-steel concrete reinforcement bars, namely: Plain, deformed, and hot-twisted.

I. MANUFACTURE

Process.

2. The bars shall be rolled from standard section Tee rails.

Hot-twisted Bars.

3. Hot-twisted bars shall have one complete twist in a length not over twelve times the thickness of the bar.

II. PHYSICAL PROPERTIES AND TESTS

Tension Tests.

4. (*a*) The bars shall conform to the following minimum requirements as to tensile properties:

Properties Considered	Plain Bars	Deformed and Hot-twisted Bars
Tensile strength, lb. per sq. in.	80,000	80,000
Yield point, lb. per sq. in.	50,000	50,000
Elongation in 8 in., per cent*	1,200,000 / Tens. str.	1,000,000 / Tens. str.

*See Section 5.

(*b*) The yield point shall be determined by the drop of the beam of the testing machine.

Modifications in Elongation.

5. (*a*) For bars over ¾ inch in thickness or diameter, a deduction of 1 from the percentages of elongation specified in Section 4 (*a*) shall be made for each increase of ⅛ inch in thickness or diameter above ¾ inch.

(*b*) For bars under 7/16 inch in thickness or diameter, a deduction of 1 from the percentages of elongation specified in Section 4 (*a*) shall be made for each decrease of 1/16 inch in thickness or diameter below 7/16 inch.

Bend Tests.

6. The test specimen shall bend cold around a pin without cracking on the outside of the bent portion, as follows:

Thickness or Diameter of Bar	Plain Bars	Deformed and Hot-twisted Bars
Under ¾ in.	180 deg. d = 3 t	180 deg. d = 4 t
¾ in. or over	90 deg. d = 3 t	90 deg. d = 4 t

EXPLANATORY NOTE.—d = the diameter of pin about which the specimen is bent;
t = the thickness or diameter of the specimen.

Test Specimens.

7. (*a*) Tension and bend test specimens for plain and deformed bars shall be taken from the finished bars, and shall be of the full thickness or diameter of bars as rolled; except that the specimens for deformed bars may be machined for a length of at least 9 inches, if deemed necessary by the manufacturer to obtain uniform cross-section.

(*b*) Tension and bend test specimens for hot-twisted bars shall be taken from the finished bars, without further treatment.

Number of Tests.

8. (*a*) One tension and one bend test shall be made from each lot of ten tons or less of each size of bar rolled from rails varying not more than 10 pounds per yard in nominal weight.

(*b*) If any test specimen shows defective machining or develops flaws, it may be discarded and another specimen substituted.

(*c*) If the percentage of elongation of any tension test specimen is less than that specified in Section 4 (*a*) and any part of the fracture is outside the middle third of the gage length, as indicated by scribe scratches marked on the specimen before testing, a retest shall be allowed.

III. PERMISSIBLE VARIATIONS IN WEIGHT

Permissible Variations.

9. The weight of any lot of bars shall not vary more than 5 per cent from the theoretical weight of that lot.

IV. FINISH

Finish.

10. The finished bars shall be free from injurious defects and shall have a workmanlike finish.

V. INSPECTION AND REJECTION

Inspection.

11. The inspector representing the purchaser shall have free entry, at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the manufacture of the bars ordered. The manufacturer shall afford the inspector, free of cost, all reasonable facilities to satisfy him that the bars are being furnished in accordance with these specifications. All tests and inspection shall be made at the place of manufacture prior to shipment, unless otherwise specified, and shall be so conducted as not to interfere unnecessarily with the operation of the works.

Rejection.

12. Bars which show injurious defects subsequent to their acceptance at the manufacturer's works will be rejected, and the manufacturer shall be notified.

TRADE REPORT No. 203

COMMON MERCHANT IRON—REFINED IRON—DOUBLE REFINED IRON—CHAIN IRON—ENGINE BOLT IRON—STAYBOLT IRON SPECIAL STAYBOLT IRON

IRON or COMMON MERCHANT BAR IRON or COMMON WROUGHT IRON or COMMERCIAL WROUGHT IRON BARS (these various names meaning the same commodity) are sold in competition or as a substitute for Merchant Steel Bars (Soft or Mild grade, Bessemer or Basic Open Hearth) for purposes in which price is an important factor to the buyer. It is made largely, and sometimes wholly, from miscellaneous scrap, both Iron and Soft Steel, such as mashed Steel Pipe, Stove Plate, Bushelings, Screenings, etc. The scrap is bundled into "piles," then heated to a welding point and finally rolled into Merchant Bars of standard stock sizes and shapes. As the various pieces of scrap forming the pile may, and usually do, differ widely in chemical and physical properties, this quality of iron, when the bar is broken cold, shows a mixed structure, fibrous and crystalline (largely crystalline), and cannot be guaranteed to be homogeneous, that is to say, uniform in quality, structure or strength. All the aforesaid is somewhat theoretical, but practically what the customer needs to know is that this material is suitable and can be recommended for general blacksmith work: it forges well, it welds well and it threads well. Due to the admixture of soft steel it will show the following physical properties:

Tensile Strength	40,000 to 50,000 lbs. per sq. inch
Elastic Limit	20,000 to 30,000 " " " "
Elongation in 8 Inches	16 to 20 per cent
Reduction of Area	35 to 45 "

In regard to bending, this material can withstand a certain amount of bending without cracking or fracturing, but cannot stand the test of being doubled on itself either hot or cold, or knotted or coiled around a pin of the same diameter without showing fracture. These tests are not required for this class of material, they being tests which only the finer grades of Iron can withstand, and whenever the customer insists on these tests, it is only the better grades of Iron that should be offered.

Iron of the grade we have described should not be confused with Refined nor Double Refined Iron, which, in the order mentioned, are superior products and are sold at an advance over the price of common wrought iron and of merchant steel.

REFINED IRON is made either entirely from selected Wrought Scrap or from Puddled Bar and selected Wrought Scrap. In the latter case the finished product commands a slight advance in price to cover the extra cost of manufacture, inasmuch as the puddled bar is made by the puddling process, part from Pig Iron and part from Cast Iron Scrap, Borings, Turnings, Sheet Iron Bushelings, etc. The Puddled Bar so obtained is then piled with the Wrought Iron Scrap, after which the pile

is rolled into size. The standard specifications of the American Society for Testing Materials require that the piles shall be free from any admixture of steel, but competition among manufacturers is so keen that a small quantity of Soft Steel Scrap finds its way into the pile for this kind of Iron one way or another, so that the breaking test will not show an entirely clean fibrous structure. In round shapes it will show a fibrous peripheric ring varying more or less in thickness and a checkered core, both crystalline and fibrous, the crystalline spots indicating the Steel and the fibrous spots indicating the Wrought Iron pieces which have entered into the forming of the pile. In flat shapes it will show a laminated structure, alternately fibrous and crystalline. The physical properties of this material are as follows:

Tensile Strength	45,000 to 50,000 lbs. per sq. inch
Elastic Limit	25,000 to 30,000 " " " "
Elongation in 8 Inches	22 to 26 per cent
Reduction of Area	35 to 50 "

DOUBLE REFINED IRON is made by the puddling process, largely or mainly from Pig Iron. The Muck Bar so obtained is piled with some selected Wrought Iron Scrap, any steel scrap excluded, and put through additional process of reheating and rerolling in such a way as to give it very great tenacity. The physical properties are nearly identical to those of Chain Iron described hereinafter, the main difference between these two grades being that in the puddling for Chain Iron no Cast Iron or Stove Iron Scrap is charged into the furnace, but only Pig Iron is used.

It is almost impossible to enumerate all the uses to which both Refined Bar Iron and Double Refined Bar Iron can be put. We will mention only a few as examples.

Ninety per cent of the weight of a railway locomotive is steel; yet it would be in constant danger of destruction were it not for the 10 per cent of Bar Iron in the locomotive. The reason for this is that the Iron combines toughness and strength with just enough flexibility and just enough rigidity to withstand the shocks, the twistings and the vibrations that come with the crossing of every uneven rail joint.

Therefore, Locomotive Frames, Spring Hangers and Equalizers, upon which the whole weight of the superstructure of the locomotive is transferred through the springs to the journal boxes, Air Brake Rigging (namely all the connecting rods, levers, beams, equalizers which compose the air brake system of a locomotive), the Cylinder Cock and the Blow-off Cock Rigs (which are a system of rods operated by levers from the engine cab), the Dump Shaft and Connections which operate the grates, are nearly always made from the above named Bar Iron. Other Iron parts of a modern locomotive are: Apron Hinges and Brackets, Uncoupling Shafts and Rods, Ash Pan Rigging, Engine Truck Radius Rods, Pedestal Shoe and Wedge Bolts, Reverse Lever and Quadrant, Smoke Box Braces, Throttle Rods and Levers, Grab Irons and Cylinder Lubricator Brackets.

Large tonnages of Iron Bars are used also on Railroad Right of Way for Switch Rods, Connecting Rods, Tie Rods, all forms of rods which must be upset threaded or drilled, Switch Stands, Guard Rail Clamps, etc.

These Iron Bars find their use also in many parts of freight cars, passenger coaches, etc. For instance, the Arch Bar Truck that supports the weight of the car, Brake Rigging, Uncoupling Shafts,

Hand Holds, Steps, Ladder Rods, Bolts, Hinges, Hand Brake Shafts, Truss Rods, Tie Rods and Braces, Coupler Jokes which hold the couplers in the car.

Here we arrive at a third category of Iron Bars, namely the best grades of Pure Puddled Genuine Wrought or All Muck Bar Iron, which carry a still higher price and are used for certain special purposes, where price is subordinate to quality. These last named Bars bear a guarantee that they are Genuine Wrought Iron made of Puddled Pig Iron only, without the admixture of any scrap. This finer Iron goes under trade names indicating the purpose for which it is especially suited, as follows:

CHAIN IRON is a special grade of Wrought Iron made from all Pig Iron (no scrap), double refined and selected to insure good welding and wearing properties. It bends cold without showing any fracture and when tested shows the following physical properties:

Tensile Strength	48,000 to 50,000 lbs. per sq. inch
Elastic Limit	30,000 to 35,000 " " " "
Elongation in 8 Inches	not less than 26 per cent
Reduction of Area	40 to 50 per cent

This material can be offered without hesitancy for making chain links and in fact is used by the United States Government.

ENGINE BOLT IRON is a high grade Wrought Iron manufactured especially for engine bolts, studs, etc. It is double refined, made from all pig iron (no scrap) from a large "box pile" which is broken down into billets and rolled into engine bolt sizes. This insures an iron free from cinder, laminations and open checks which makes it a product that will case harden well without blistering or change of size. When tested it will show the following physical properties:

Tensile Strength	49,000 to 51,000 lbs. per sq. inch
Elastic Limit	30,000 to 35,000 " " " "
Elongation in 8 Inches	not less than 28 per cent
Reduction of Area	40 to 45 per cent

Cold and hot bends on itself without fracture.

This Iron is sold to railroads which require a better grade of Wrought Iron than that which is made by reworked scrap, and this grade of material will give universal satisfaction for parts requiring case hardening and high tensile strength together with great ductility.

STAYBOLT IRON is manufactured along careful, scientific and progressive lines to meet severe service conditions found in high pressure boilers and will stand the highest vibratory requirements. It is manufactured from a pure grade of pig iron (no scrap) by skilled workmen, under careful surveillance and most competent direction. This is a triple refined product and will meet all specifications for Staybolt Iron. When tested it will show the following physical properties:

Tensile Strength	48,000 to 50,000 lbs. per sq. inch
Elastic Limit	30,000 to 35,000 " " " "
Elongation in 8 Inches	not less than 30 per cent
Reduction of Area	35 to 50 per cent

Cold and hot bends on itself without fracture. Cold threaded bends around bars of equal diameter, shows clean fibrous structure free from crystallization. Especial care is used in the selection of ores and resultant pig iron entering into the manufacture of this Staybolt Iron. The "piles" from which the bars are rolled are formed with a view of securing the highest degree of flexibility for the staybolts, to enable meeting the most exacting vibratory requirements without sacrificing the physical properties and ductility.

SPECIAL STAYBOLT IRON is the "non plus ultra," the highest grade of Iron Bar manufactured in America. It is quadruple refined and is considered equal to any bar iron manufactured in Sweden, Norway or England. The additional working which the quadruple refining involves assures the consumer an extremely clean fibrous material which will meet most severe service conditions in the highest pressure locomotive boilers in bad water districts. The following are the typical physical properties this material will show when tested:

Tensile Strength	48,000 to 50,000 lbs. per sq. inch
Elastic Limit	33,000 to 35,000 " " " "
Elongation in 8 Inches	not less than 30 per cent
Reduction of Area	" " " 50 "

Cold and hot bends on itself without fracture, shows clean, long fibre, free from crystallization. Threaded, it bends around a pin of equal diameter, can be twisted or knotted in any way whatsoever and will meet any special specifications that can be obtained with Iron. It will also show very high vibratory tests.

We hope this report will clear all confusion of ideas in regard to merchant iron and avoid the danger of misrepresenting the product offered or expecting too much out of the quality selected. It is to be borne in mind that due to the method of manufacture involving a greater amount of labor, Iron Bars, outside of the grade called Common Merchant Iron or Ordinary or Commercial Bar Iron or whatever other name the manufacturer might give to it, cannot be procured even in normal times except at a higher price than the price of Merchant Steel. Merchant Steel, both Bessemer and Open Hearth, therefore, outsells and in normal times has steadily supplanted some of the finer grades of Iron Bars. However, there are some uses, such as railroad locomotives, boilers, etc., in which nothing less than the highest grades of Iron will do, and in these cases the consumer is generally willing to pay the price. Whenever sending inquiries for these materials the purpose for which they are intended should be specified.

All the figures that have been given in this report in connection with the physical properties of the different qualities and kinds of Iron Bars which we have named are to be taken only as a guide. They are not guaranteed, although, with the exception of the Common Merchant Iron, they can be guaranteed upon request. When guarantee is requested, the material will be offered subject to inspection at the mill and the customer should be advised that an extra cost for inspection is to be levied by the manufacturer and that in addition must be borne all expenses for the services of an inspection engineer. We might add that actual inspection is very seldom requested and then only for the four highest grades of iron.

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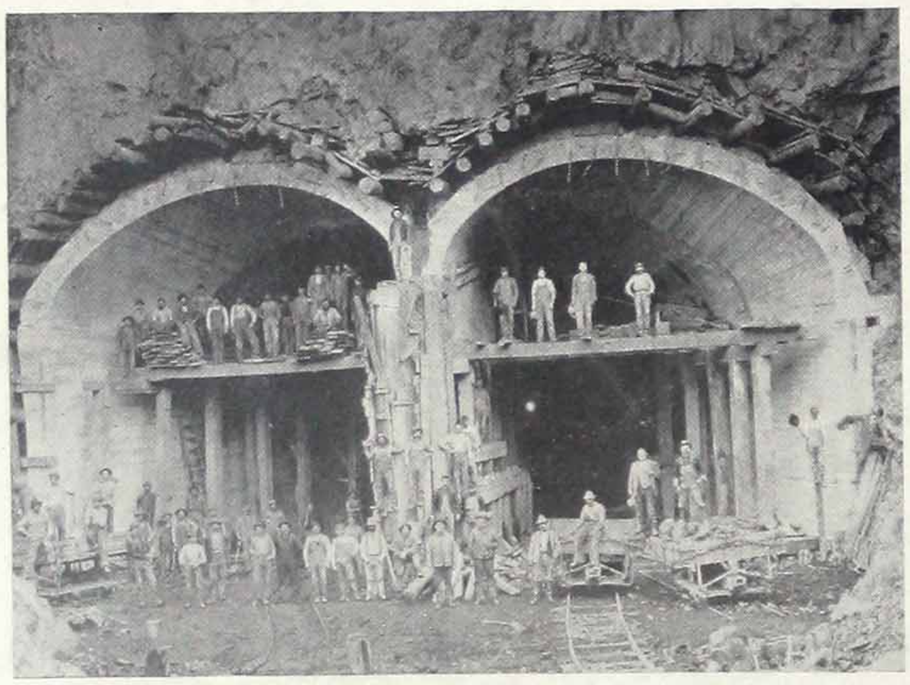
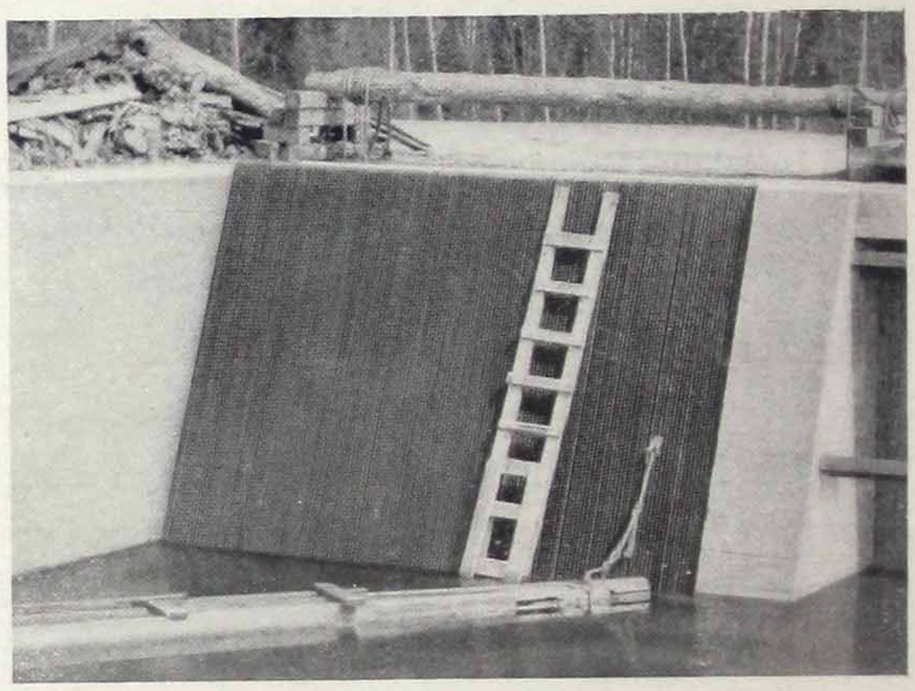
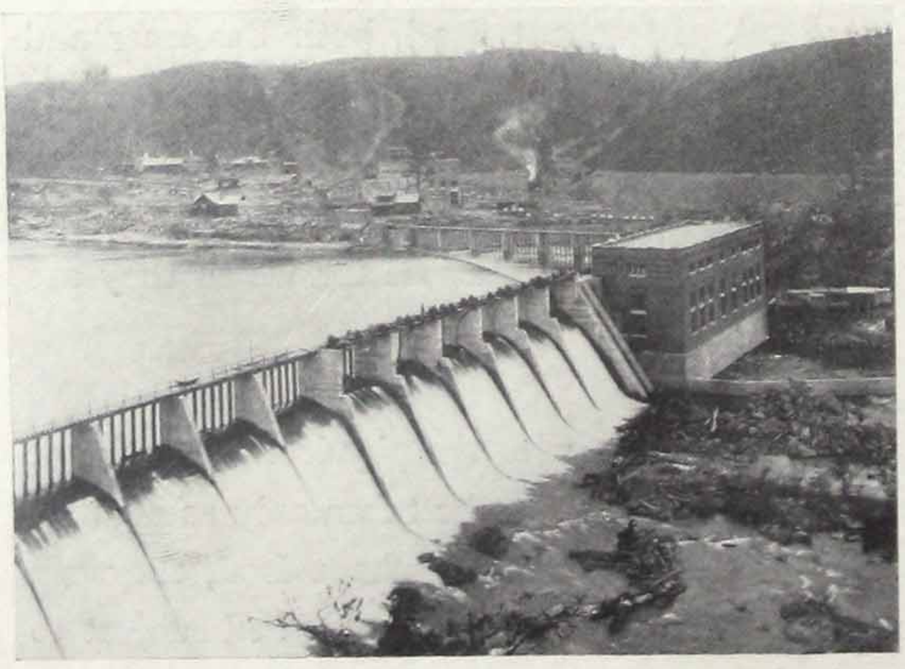


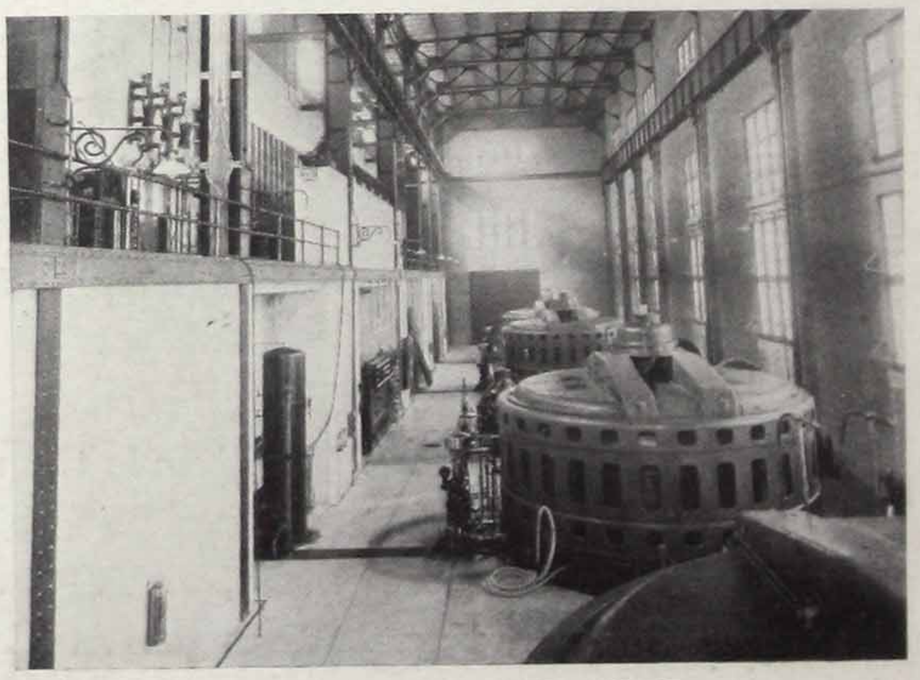
TUNNEL PORTAL



STEEL BAR WATER INTAKE SCREEN



GENERAL VIEW OF HYDROELECTRIC PLANT



INTERIOR OF POWER HOUSE

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